# JOURNAL OF GAS LIGHTING & WATER SUPPLY.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXXXI., No. 2723.] TUESDAY, JULY 20, 1915. [67TH YEAR.


## EDWARD ALLEN.—AN APPRECIATION.

A LIFE crowned with honour, integrity, faithfulness, and wide and deep friendships has come to a premature close. Edward Allen is no more in body; but his work and example live in our midst. His memory will be cherished by all who knew him, by all who have felt the cordial shake of his hand, by all who were accustomed to his never failing cheerful greeting, by all who shared his confidences, by all who were brought into contact with him in any walk of life. As we begin this our sorrowful duty, memories have rapid upcoming in which he is the central figure, and which show us how much has been the activity of our friend, how large the place in the professional and the industrial work that has now to be filled. Realization of these things can sometimes only be reached by review; and review is compulsory now. The news of his death in the morning came as a shock last Thursday. It had been known throughout the industry for some fortnight before his death that he was seriously ill; but the vitality and vigour of several years in the place to which merits and high regard had lifted him in the professional and general life of the industry allowed no thought of that place being so early vacated by the Last Call. Only seven weeks ago, he was speaking (the figure and scene are present now) at the meeting of the Institution of Gas Engineers; and since then he has been busy with his voluntary labours for the nation in connection with the High Explosives Committee and the recovery of toluol. His work is finished. Over it may be written in all sincerity and truth—"Well done."

Kindly, genial, and very human was our friend; and for these qualities alone—quite apart from his professional accomplishments and sound practical judgment—he gained the affection of all. He gained that affection because he was what he was; and what he was he could not help being. He was a man of strong convictions. He taught of the higher life in season; in his daily business and professional life, without breathing a word of those things which were of his very soul, he practised the precepts treasured by him, and by so doing gave good example to his teachings. But there was never gloom where he was; he was an example of a cheerful and tolerant man with the deepest religious convictions. To those whose views were not his own on any subject, he was generous, and never displayed bitterness, or showed any of that egotism which denies to others the right of a different opinion. As Engineer of the Liverpool Gas Company (in which post he succeeded Mr. William King), Mr. Allen filled a high position in the gas industry; and he did so with dignity, with conscientiousness, and with an abundant success. He held the confidence of the Board and of the proprietors; and to the staff and workmen there was something, indefinable perhaps but there, which made him to them all more than the Chief Engineer and General Manager. In his technical work for the Company, he was far-sighted; in his commercial bargainings, acute but just. The interests of the Company were his charge, and those who sought business with him found him inflexible on the point of what he conceived to be right and fair. With them all there was courtesy; but firmness prevailed. In gas policy, he was progressive and practical. He chafed under, and sought freedom from, the influences of a long tradition. His foresight and endeavours succeeded; and the Company are in consequence in a stronger position to meet the requirements of the present and the future than ever they were. The reduction of the illuminating power standard, and later the substitution of a calorific value standard, are among the best efforts that have put the concern in a more powerful position for the future. Though occupying a high professional position, there was nothing of the big man about him. He was accessible to all; and his counsel, drawn from the depths of a large experience, was always helpful.

There was one side of Mr. Allen's life which was prominently before us. He was self-sacrificing to a fault; and in this characteristic, and the vigorous interest he took in those things to which he set his hand, may perhaps be traced one cause of the hastening to the end. He worked, given the opportunity, well and consistently for the industry—technically and commercially. One excellent illustration is to be found in his presidential year of the Institution of Gas Engineers. Successor to Sir Corbet Woodall in the seat of highest honour in the profession was a sufficiently difficult position for any man; but he took it as a duty, and in the duty he found pleasure. The first half of his year of office was the second half of the Jubilee year of the Institution. It was the half in which the Great National Gas Exhibition was held at Shepherd's Bush. The President had then much work to do. Even holidays were forfeited in order to devote the days and the weeks to the exhibition and its interests. He also did that year and since a great deal in the parliamentary arena in connection with the interests not only of his own Company but of the industry generally. We do not remember a District Association at one or more of whose meetings during that year—1913-14—he was not present. In the work of the British Commercial Gas Association he took an active part; at gatherings of the Society of British Gas Industries he was an honoured guest. He believed strongly in the cogency of co-operative publicity and educational effort in relation to the broad interests of the industry. Co-operation was with him a principle; and this led him to take active part in the proposals for a scheme of unification of all that was part and parcel of the industry, in order the more effectually to promote and to defend its interests. Indeed, he became an ardent and persistent advocate of whole and not partial central representation. There came the urgent call of the nation, through the High Explosives Committee, to the gas undertakings of the country for special work in the provision of necessaries which were, and still are, required in larger volume. Mr. Allen willingly responded to the invitation to take part in organizing systematic production; and in this, as in other outside honorary or voluntary work, his Directors allowed him very full liberty of action. The Chairman (Mr. H. Wade Deacon, J.P.) and his colleagues felt, apart from the question of patriotic duty, that Mr. Allen's services to the Liverpool Gas Company, extending over fifty years in various positions, entitled him to some freedom in following the bent of his own inclinations and wishes; and it was their desire that he should enjoy more leisure than he permitted himself from official and other duties. On top of all this, our indefatigable friend had engaged to represent the British gas profession and industry at the Gas Congress to be held at San Francisco (in connection with the Panama-Pacific Exposition) in the autumn of this year, on which occasion he was to read a jointly-produced gas paper, of one part of which he was to be the author. Events and work at home induced him to withdraw from undertaking the journey; but we believe the rough draft of his portion of the promised paper had already been partly, if not wholly, prepared.

The life now ended was a full and useful one. The highest motives prompted its actions. With the deepest sorrow we lay to final rest a good friend; and to-day Mrs. Allen and the family are surrounded by the sympathy of a multitude of men who knew and honoured the husband and father.

# EDITORIAL NOTES.

## Increasing the Market Value of Tar.

In other columns is printed an important and timely (jointly contributed) article headed "The Market Value of Light "Oils and Other Constituents of Tar." The article is something more than the title indicates. Treating gas by tar has become a common practice in British gas-works; and the process it is known—carried out at normal temperature, with a good area of tar surface in relation to the quantity of gas to be treated, and with proper contact—has a considerable effect in transferring from the gas to the tar more light oils than are ordinarily contained in crude tar. If one looks at the tables embodied in the article, there is seen a very important monetary enhancement of the value of tar by the new treatment; and what our contributors are therefore mainly concerned about is that the gas undertakings which do not employ a competent chemist, and have not the necessary plant for making a proper tar-distillation test, shall take such steps as shall ensure to them receipt of the additional value of the tar. The large gas-works can defend themselves in this regard; but it is not so easy for works to do so which are not so powerfully circumstanced. The result is that there has already been over this matter some disagreement with tar distillers which must be adjusted; and adjustment can only be made on the analytical showings of distillation tests. Incidentally, too, the article proves that there is money in the process for the gas maker.

The foregoing indicates the main purpose of the article; but the contribution goes beyond that. It includes suggestions for attempting to improve the current market value of certain constituents of gas-works tar, and then proceeds to discuss various features of the tar-washing process with the view of obtaining from it the best results. The critical point about the whole process is temperature; and an amount of supervision and watching are necessary, in order that it shall not go astray, and the gas extract from the tar constituents which the process aims at supplementing, and not diminishing, in the tar. This reversal of the designed order of things has been an experience at some gas-works. But it can easily be rectified; and means of rectification are also described in the article. Our contributors, it will be seen, have preference—and in many works operation is proceeding this very way—for the use of a tower scrubber, instead of a washer, in carrying-out the process, in view of the large area of tar surface which it is possible by this means to present to the gas. The process, of course, has brought forward fresh conditions; and there are certain matters which gas men would like to see determined. One is as to the degree to which temperatures can be reduced in order to obtain the best financial value from the gas and the tar, and to what extent the composition and (if at all) the stability of the gas are interfered with by the process. Besides the enhancement of the financial value of the tar, one good effect found has been that, where there is efficient tar treatment, naphthalene is completely extracted from the gas.

## Price of Coal (Limitation) Bill.

If the coalowners had any idea that the Government had no serious intentions in regard to the regulation of the pithead prices of coal to an amount which would give them the prices realized under similar circumstances during the year ended June, 1914, *plus* a fixed standard addition to cover the increased costs due to the war, they have been befooling themselves. The Price of Coal (Limitation) Bill, which Mr. Runciman introduced to the House of Commons last Tuesday, attests the fact; and there can be no longer any doubt on the subject. The promotion of the Bill, in the form reproduced in our "Parliamentary Intelligence," shows that the President of the Board of Trade in his efforts to come to terms with the coalowners exhausted both his powers of persuasion and his patience. When one looks into the history of the movements of coal prices, and the causes and measure of the movements, it is not difficult to appreciate somewhat the inexorable nature of the difficulties with which Mr. Runciman found himself confronted in trying to induce the coalowners to, during the period of the war and for some months afterwards, give up their liberty in regard to the fixing of prices. The promotion of the Bill, too, alleges, not in word but by the fact, that—despite the assertions as to pits here and there operating at a loss, and other tales intended to excite pity and sympathy or admiration for heroic self-sacrifice, which tales are quoted freely as though representative of the whole—the Government, the further they have gone with their investigations, have become the more satisfied that the war has been unpatriotically made a field of vantage by the coalowners. If they could have satisfied the Government that this was not so, there would have been no necessity for the Bill, which will for ever stand a memorial to the need of the nation's protection against profit-grabbing in these critical and perilous days. If it represents aught else, then we should like to know what it is.

With regard to the clauses of the Bill, the greatest difficulty will be unless the purchaser did business with the same colliery about the same time during 1913 to 1914 to fix the corresponding price of the like coal upon which the standard of 4s. per ton is to be placed. There seems to be something lacking in the Bill in this connection. If any dispute arises as to the corresponding price, the Board of Trade take power to adjudicate, and to call for all the information and documentary evidence required for the purpose. It would be an excellent thing if the coalowners were compelled to publish day by day the corresponding pithead prices, with penalties attaching for default or proved deliberate misstatement. In regard to the proposed standard of 4s. per ton, this is 3d. less than the recently elected Committee of Parliamentary members, with Sir Corbet Woodall as the representative of large purchasers outside the parliamentary ranks, suggested should be the sum. The standard of 4s. shows that the Committee were prepared to act even more generously than the Board of Trade are willing to do, with before them the accumulated mass of evidence as to what is fair in the circumstances. But discretionary power is reserved to the Board to raise the 4s. per ton in special cases. The measure, it is intended, shall also apply to coal contracted for at a price including transit and delivery; and here there will be a second element for determination—that is, the amount of the additional charges beyond the pithead prices. In the case of such contracts, buyers have hitherto frequently been totally unacquainted with the pithead prices; and it might be worth consideration as to whether contracts for coal free on works should not—at any rate during the application of the measure—quote separately the pithead prices and the additional charges. There are coal factors who will not appreciate the control of their business in this manner. The Government, however, have been convinced as to the necessity, and the impossibility of making any difference between transactions with a colliery direct and through an agent. Again, in any dispute with contractors as to how their charges are made up, there is reference to the Board of Trade, whose decision in this (as in other cases) will be final. While the maximum fines for furnishing false information and contravening the measure are placed at the substantial sum of £100, this is a small amount in comparison with the money represented by even a few pence, let alone shillings, per ton under some contracts. And there are gas coal contracts that have recently been made—not at 4s. increase above the pithead price of 1913-14, but at 5s., 6s. and even 7s. per ton in excess. We are not prepared to class all coalowners as unscrupulous plunderers; but it is a salutary provision which will have a retarding effect on those who would evade the measure (when it has passed into law) which gives power to impose upon them a fine to the extent of treble the amount of the difference between the sum demanded and what should have been the maximum price under the terms of the measure.

The Act (when the Bill reaches that state, if Sir Joseph Walton, as a representative coalowner, does not succeed with his interested motion for the rejection of the Bill), it is proposed, shall not apply to exported coal, coal sold for the manufacture of patent briquettes or for use on ships, nor to coal sold under contract prior to the commencement of the Act. The last-named provision is of importance, because contracts have been made in which a clause has been inserted making them subject to any terms laid down in any legislation passed by Parliament. To avoid dispute, an exception should be made of such conditional contracts, so that the plea could not be, as it might be, raised that the Act cancels the condition. It is not surprising that the Act is not to be retrospective, as it would mean that, if some past contracts had to be levelled-down, the coalowners would no doubt claim that Parliament should provide for other contracts made earlier in the year being levelled-up. This is the only reason that occurs to us against the measure

being retrospective; and we are quite open to consider, and if substantial to be persuaded by, reasons in favour of the retrospective application which Sir Arthur Markham (who is a colliery owner) regards as correct. However, the non-retrospective clause, it must be admitted, will bear hardly on household coal contracts, seeing that for next winter the greater part of the provision for London has been made. But the Government will no doubt take good care that the coal merchants do not again sweat profits out of householders owing to the existence of the war—particularly out of those who are only able to buy in small quantities—as was the scandalous case last winter, and in which iniquitous gains coalowners shared according to an agreed proportion. There is a point that is not dealt with in the measure; and it is that the coalowners should be made to disgorge, through special taxation, some of the extra profits made since last Christmas, or assured to them by contracts at heavier prices than the 4s. that has been determined by Parliament to be a reasonable increase over the prices of 1913-14.

It will be seen from these comments that there is room for some supplementing of the powers proposed by the measure, which has been forced into being by the imposts of an unregulated and arbitrary ownership.

## Mr. Carpenter's High Ideals.

THE indispensability of science to industry and of industry to science is an accepted truth, though the practices of industry do not uniformly betray the connection. But it is very rarely now that one hears the man of narrow intelligence attempting a controversion of the indispensability of the one to the other. It is also accepted that in some directions the Germans have beaten us in the industrial race, not because we are short of the scientific talent to devote to wider, deeper, and continuous research, but because there has been an insufficient fusion of that talent with the work of industrial progress. Hard facts compel us to admit, too, that, when Germany has got ahead of this country in any particular respect, through the combination of chemical and industrial research, there has been a disposition for our manufacturers to leave the field almost unchallenged to their more successful competitors. The success of Germany in certain directions has some ratio to British lethargy. All these things are very generally conceded now; but the country goes about the mending of these conditions in a haphazard sort of way. A University is established here, an Imperial Technological College there, a technical school somewhere else, and a National Physical Laboratory elsewhere. They each and all have independent organizations, and arrange their own particular lines of operations. Efficiency is lost through this, as well as by the poor advantage that is taken of their capacity. Everything is disjointed; and no general system controls the scientific and technological provision for the welfare of the country at large. So we shall continue to shuffle along, until something is done to co-ordinate affairs, and to make the most profitable use possible of these various institutions.

Mr. Charles Carpenter, D.Sc., the Chairman of the South Metropolitan Gas Company, has a bolder scheme than this. His ideals are great and far-reaching; and we do not entertain any hope of seeing (however much we might wish it) these ideals attained within our own times. In a paper at the meeting of the Society of Chemical Industry at Manchester last week, he put forward these ideals. Every special industry, he thinks, should build-up its own scheme or institute of technology—not only to provide training for workers, but with fully equipped resources, so that problems of all kinds in connection with the industries could be submitted to these specialized establishments for research. There is so much overlapping of research now, and so much is done that has already been done, that a central institution of the kind in each industry would be a producer of research economy where there is now great waste. Besides this there would be a valuable yield from the continuous penetrating work which is essential to improvement and progress; and from the stores of the accumulated and centralized knowledge, the industries could freely draw. This is fascinating, and all very good indeed if there could be achievement. But is it likely?

The past does not give very much room for hope. We recollect—and the recollection is not exactly a pleasant one—the beating-up that there had to be in amassing sufficient money for the Department of Coal Gas and Fuel Industries at the Leeds University; and there are not many industries with appended to them such a department as this. The need may have been felt; but it has stopped there. There has been no attempt by these industries at founding such departments, and no one seems to have had the courage to try and get the money for the purpose. Mr. Carpenter's heroic measures for marshalling the scientific forces for promoting through the industries the country's greater prosperity would clearly require in the aggregate an enormous amount of hard cash; and yet we are quite prepared to own that the greatest industrial efficiency, economy, and result lie in proper organization. The ideal does not end there. Over all these various industrial scientific centres, Mr. Carpenter would like to have a Royal College of Technology—State-aided and independent—from which would flow control, inspiration, and direction. The aspiration is great; its fulfilment a matter of more than simple doubt. Would it not be better to first see whether anything could be done to obtain, by reorganization and a better distribution of work over the whole of existing institutions, a greater efficiency, and so effect at any rate a part realization of what Mr. Carpenter has framed as the ideal requirement in making the best of the resources of the country to the enhancement of its prosperity? Certain it is we could not afford in these times to set about scrapping present institutions.

The best we can wish Mr. Carpenter is that he may live long enough to witness the materializing of his vision, and with mental capacity then unimpaired, so that he may the more keenly enjoy dwelling upon the fulfilment.

## Gas-Engineering Types and Practices.

A SERIES of articles is now appearing in our columns describing the new gas-works of the Hungarian capital—Budapest. There is, we regret to say, a double appropriateness in the articles at the present time; we wish there was only the single one of a description of an excellent piece of modern gas-engineering work on the large scale. It is, however, from the latter point of view that the description must be regarded, because there is in it room for the congratulations of gas engineers to both the Budapest Corporation and their technical gas advisers on the progressiveness embodied in the new works, and of the results of which gas engineers will want to know more anon. Like the consumption of gas, types and methods progress in gas engineering, which progress upsets conceptions and practices, and establishes new ones. In these works at Budapest, one has the plant designed for bulk working and diurnal carbonization. A very considerable amount of money has been spent upon the works; and this expenditure cannot be judged by the ordinary standard of the relation of production to capital outlay. Several reasons exist for this. There appears to have been a large amount of money expended at certain of the old works on carbonizing and other plant, on gasholders at various places, on the land for the new works, and no less than £83,000 was involved in connection with dykes, and in raising the level of the ground, while workmen's dwellings have been erected and a regular colony established in the vicinity of the new works. The Corporation only entered into possession of the undertaking in 1910; and they at once took into consideration the question of what must be done to meet the demands for gas, pending the construction of new works, as well as a scheme for the latter.

The estimates for the works' plans (which the Corporation went to great pains to have verified by some of the best available technical judgment) totalled to £1,667,000. In the result, the expenditure has been, to the extent that the scheme has been carried out, £1,042,000; so that the Corporation have covered by their vote of the larger sum the extensions that are to be made as required to round-off the scheme. The new works, the first section of which has been completed, are designed for an output of 35 million cubic feet per diem; the first instalment being equal to a production of 9,532,000 cubic feet. Here, again, in considering the question of capital expenditure, there is a substantial sum represented in the outlay for work and plant in preparation for the fuller development of the scheme. So that one can well see the impossibility of forming any judgment by the application of the usual standards as to whether or not the work has been economically executed. As a matter of fact, these standards are sometimes vitiated in their application by the fact that the most economical forms of construction in relation to capital expenditure are not necessarily the most economical in the ultimate financial result. By wise extra expenditure upon plant, it may be possible to purchase

increased production and working economies which will well repay the additional outlay.

This is undoubtedly the point of view which was kept in particular prominence in designing the new Budapest works; and the economical issues will only be clearly and materially unfolded as the development of the works proceeds. But, although it is said that the works have fully justified themselves in the matters of productive capacity and economy, they have been unfortunate in the restrictions imposed to the making of full demonstration of these things through the intervention of the terrible war. However, in these works, we have a complete reversal of old gas-engineering practice in carbonizing plant and operating method. Here are 78 horizontal chambers on the Koppers system, each of which will hold 10 metric tons of coal—the charges running for twenty-four hours. Think of the time when for gas manufacture small weight and short-hour charges were the vogue, and contrast those practices with the ones adopted by the responsible engineers to the Budapest Corporation, and confirmed by some of the best Continental engineers of the day. Verily, the old order changeth, and gives place to the new, in a strongly marked degree; and the new with time justifies itself against the many difficulties—some actual, some imagined, all largely or wholly amenable to the devisings of engineering talent—which have beset its application for gas-works purposes. Then all these carbonizing chambers are heated from a central installation of twelve Kerpeley producers, of the revolving grate type. The chambers are fed from a reinforced concrete coal tower, capable of holding about 1200 tons of coal. The Koppers direct ammonia recovery process has been installed; so the loss of ammonia is kept to the best realizable minimum. Only a small quantity of liquor has to be treated; and consequently the cost of steam is small. The testimony of the engineer is that the process is both trustworthy and cleanly, as it is carried out almost wholly mechanically. Turbo exhausters and turbo compressors have also been installed; there is electrical plant and electrically operated machinery; there are Diesel oil-engines; there is a works' water supply; and a self-contained completeness is given to the whole by the experimental works and chemical laboratories, fittings shops with machine-tools, workmen's dwellings, and provision for the comfort and health of the men. The pictures which rise in memory of the embodiments of old ideas and practices which at one time were thought good, look strangely insignificant against what is presented by these and other changes.

There are three general points in the articles that are striking. Budapest, as the capital of Hungary, is one of the leading cities in Continental life. But in 1910 the Corporation entered into possession of the gas-works—long after electricity had been a municipal enterprise, and had been doing large part in meeting the artificial illumination and motive power requirements of the city. But so satisfied were the Corporation as to the growing indispensability of the service of gas, that possession of the manufacturing and supply systems was at once followed by the scheme of new works, and the scheme of new works by the vote of £1,667,000. These are points which show confidence, and an appreciation of need, which confidence and appreciation are justified by the fact that in Budapest between 1910 and 1913 the consumption of gas advanced by 32 per cent. We have had pointed out to us occasionally how largely electricity has entered into, and progressed in, the life of the capitals of the world. Nevertheless, the progress of gas is unabated. These facts only mean that enlargement of population, expansion of work, and the development of new applications have provided scope for the two great industries to go forward without any permanent interruption of either the one or the other. Gas is wanted to-day more than ever it was in the pre-electric days. The consequences are that Budapest has constructed its new gas-works on the large scale, Vienna not long ago did the same, the considerable sum voted for like purpose by the Paris Municipality is fresh in memory, Berlin has had material sums spent upon its gas-works in recent years, New York has had an enormous gas-works scheme carried out during comparatively late times. Though London cannot boast of immense new gas-works, it can show a large modernization and an increased productive capacity, as well as the introduction of new systems; and in most of its suburbs, there has been an almost unceasing necessity for extension in order to meet the expansion of populations and requirements. If all the work that has been lately done in connection with the gas systems of London and its environs could be presented in mass, it would show something of very gigantic order. Besides which there are considerable schemes in embryo. All this makes a good story of expanding business and public confidence in the gas industry at home and abroad, in addition to the point as to the expanding business being accompanied by progress in gas-engineering designs and practices which have contributed to progress pursuing the lines of a greater economy.

## The South Suburban Meter-Rent Mistake.

The Directors of the South Suburban Gas Company have admitted that an error was made in proposing—at any rate in the present time of high-priced gas—to bring down the meter-rents in the West Kent and Bromley areas to a common level for all sizes of meters, and to double the flat-rate of 3s. in the old South Suburban area, from which is derived the bulkiest part of the Company's business. The admission is in the form of the withdrawal of the circular. Certain points that have been raised on behalf of the Company are discussed in an article appearing on a subsequent page.

## Consumers and Ratepayers.

It may frequently be noticed, in connection with debates at council meetings, that opinions are expressed on the subject of capital outlay on gas undertakings, and the return on this outlay to the ratepayers, which show that the speakers may not have fully considered all the facts. A case of the kind may be cited at Burton-on-Trent, where last week, when the annual report of the Gas Committee was submitted to the Town Council, one member said he found there was a total capital outlay of £270,000, for which the ratepayers were only getting a return of £3561. In speaking as he did, and protesting that he was not satisfied, this councillor, of course, had nothing but the welfare of the citizens in mind; but there are one or two other figures bearing upon the matter which, had they been mentioned, would certainly not have had the effect of strengthening his argument. While it is quite correct to say that the accounts show a total capital outlay of over £270,000, it might at the same time be pointed out that this figure is immediately followed by the statement that, of the amount named, £73,436 has been provided out of revenue. Now, who found this sum which has been provided out of revenue? The gas consumers or the ratepayers? Surely, the revenue of the undertaking comes from the pockets of the consumers; and, if so, the ratepayers' claim in the matter may be questioned. To ask for a "return" on an investment which was never made would sound something like a contradiction in terms. And there is yet another point. With a capital expenditure, as aforesaid, of £270,000, the total outstanding debt is now shown in the accounts as £45,167. Even after allowing for the sum provided out of revenue, a goodly amount indeed has been liquidated! Who has provided the money necessary for this liquidation—the gas consumers or the ratepayers? If the present year's profits are the lowest, with one exception, for 35 years, it looks as though there has been no need to call for rates-in-aid; and so the consumers must have been year by year paying off the debt. Again, is it correct to talk of a "return" to the ratepayers on the capital paid off by the consumers? There is £45,000 still outstanding; and to the extent that this constitutes a liability on the ratepayers, they could certainly fairly claim compensation. Will anyone who studies the history of the Burton-on-Trent gas undertaking feel inclined to argue that for this "risk" a sum of £3561 in respect of one year is not a handsome "return?"

## Progress of the Dye Scheme.

Although nothing has been made public lately as to the operations of British Dyes, Limited, the silence must not be construed as meaning inactivity. The Board of Directors have two goals before them; and they have been pressing forward to attain them by the most practical of methods. The one is to satisfy the immediate requirements of this country in respect of dye-stuffs, and the other is to make the country independent of Germany in the same direction. There are indications that the German dye-makers do not look with benevolent eye upon these doings. They do not like the appearance of the first amount of solid cash placed at the disposal of the Directors by the shareholders and

the Government—£1,018,000. There is something about the rotundity of the figure which proclaims real business; and if the development work answers its purposes, the German makers know there is more money where this sum came from to build-up a big home dye supply. The position is not a happy one for them. That is not this country's worry, nor has it at the present time any sympathy to spare for German manufacturers. Their foreign trade is simply in a state of quiescence; and when they are allowed to make a broader survey of affairs over the current restricted commercial frontiers of Germany, they will discover that the period of their enforced partial idleness has been one of great activity to others. Another indication of their discomposure over the future of their one-time dye supremacy is that they have threatened within the past few days to reduce the supply of dyes to Swiss consumers if the Swiss dye manufacturers export their produce. But the friendly relations of the Swiss manufacturers have a distinct inclination towards this country. The German dye makers have only to thank the foul thing, Prussian militarism, for the awkward position in which they find themselves.

### Moving towards the Goals.

It was at the statutory meeting last Tuesday that Mr. James Falconer told the tale as to what the Board had been doing in the matter of satisfying the present dye requirements of the country, and to establish an independence for the future. It has not yet been settled what the Company will have to pay for the works of Messrs. Read Holliday and Sons; but the estimate is £422,000. However, the works are already in the Company's possession; and the output and variety of dyes have already been doubled, and developments are proceeding. Then there are the good relations with Swiss producers, who constitute another source of supply. Of course, the establishment of a complete independence of Germany in this matter is opposed by no mean difficulties; but if brains can overcome difficulties, they are going to be brought under subjection in this instance. While expansion of the productive capacity of the Company is proceeding, the Board are founding a research department, which will be a fine exemplification of the interdependence of science and industry. The Board, too, are also availing themselves of the special arrangements in existence at the Leeds University for the study of dyes. Dr. G. T. Morgan, F.R.S., of the Royal College of Science of Ireland, has been invited to become the head of the research department; and a Technical Committee has been appointed under the chairmanship of Dr. M. O. Forster, F.R.S. This Committee is supplemented by an Advisory Council, constituted of distinguished scientific men, under the chairmanship of Professor Meldola, F.R.S. Among the fourteen members of the Council, we notice Professor Percy F. Frankland, F.R.S., and Professors A. G. Perkin, F.R.S. (Leeds University), and W. H. Perkin, F.R.S. (Oxford University). Thus, through the sons, the name and memory, the diligence, and the perseverance, of Sir William Perkin will be kept before the distinguished group of workers who are to help to do now what this country neglected to do years ago, and which neglect contributed largely to the success of Germany on this and other chemical grounds. The Board have also well in hand a scheme for providing well-trained chemists. In this connection, the information is given that the construction is to be proceeded with at once of new works and the installation of plant of modern type and large capacity. The German dye makers are not happy.

**Coke Sales in America.**—It seems that in America those who have coke for disposal are faced with much the same problems as in normal times obtain in this country. The "Gas Record" says: "We have new conditions in the coke market of America which make more important than ever the cultivation of a local demand. More coke is being produced now in this country than ever before; and still more is coming in the near future. The solution lies in a careful analysis of your own community—all its domestic and industrial possibilities—and a determination to cover this field with a good fuel at a reasonable figure, *plus* prompt and courteous service. We have with us always the sloths who would sooner dump their output on the market at an upset price, thereby injuring their fellow gas men; and there are the big new coke-ovens with their enormous production to consider. But steady application, each to his particular field, should serve to solve these problems. In addition to his duties as financier, operator, chemist, &c., the gas man must now become an expert canvasser and merchant.

## PERSONAL.

Mr. C. F. Farrington has been appointed to succeed his father—the late Mr. T. B. Farrington, of Llandudno, whose death was noticed in the "Journal" for May 11—as Engineer to the Colwyn Water Board, which supplies Colwyn Bay and Conway with water.

## OBITUARY.

Mr. A. J. Swain, for some time representative of the Bland Light Syndicate, and who joined the Army in the 2nd King Edward's Horse soon after the outbreak of war, has been killed while on duty in the trenches with the Canadian contingent.

The death occurred last week, in a Leeds nursing home, of Mr. Mark Dalton Wordsworth, who for the past three years has been Assistant-Manager at the New Wortley Gas-Works of the Leeds Corporation. Mr. Wordsworth was only 31 years of age. He began in the service as a boy, and had become very popular with both the officials and workmen.

On the 6th inst., at Bournemouth, Mr. Walter Benson passed away in his 62nd year. He was for many years Chairman of Messrs. D. Hulett and Co., Limited, of High Holborn, and was also on the Boards of Messrs. Kirkham, Hulett, and Chandler, Limited, the Herne Bay Gas Company, and the Barking Gas Company, till its absorption a short time since by the Gas Light and Coke Company.

## A FIFTY YEARS' REVIEW.

From Messrs. J. G. Hammond and Co., Limited, we have just received Part I. of "Gas Engineering and Gas Manufacture: A Review of the Work of the Institution of Gas Engineers." Without the secondary part of the title, the first part would have been inadequate, seeing that much more than engineering and manufacture is comprised in the work of the Institution. To make a review over half a century of the work of an Institution which has stood as the central organization of such an ever-expanding industry as that of gas manufacture and supply is no light task; and probably now that he has completed his self-imposed labours, Mr. Charles W. Hastings, the editor and compiler, would be loth to again begin a similar piece of work. It has, however, a measure of value—both technically and historically. It is true that much of the technical and commercial work of the past has been superseded by modern practices; and energy is now being devoted, by the force of circumstances and the growth of knowledge and experience, to the gaining of new economic territory for the gas industry—by developing upon the present conditions. Nevertheless, many of those who are now engaged in this work have but a very slight acquaintance with the roads along which their predecessors have travelled; and therefore there will be interest for them in the present outline (incomplete though it may be) of the history of the work of the Institution, in that this history partially traces the advance of the technical affairs of the industry. We cannot, however, recommend the work as presenting any consecutive history of the development of any particular subject; and therefore in subscribing to it, readers must take it for what it is—an epitome of proceedings and nothing more. As such, there is much value in what Mr. Hastings has done for many busy present-day workers, who perhaps, at the jubilee celebrations of the Institution, were not altogether displeased that they were not of the founders of the organization. Besides the technical and commercial work of the Institution, its domestic side—the tale of its progress, with alternations of calm, storm, and schism—is presented by the reviewer.

The work (comprising some 400 pages) will be completed in six parts, price 2s. each, net. It "reviews"—fairly well in some cases, imperfectly in others—fifty addresses and some 450 papers. Portraits are given of the Presidents, and interspersed are personal and biographical notes regarding the leaders of the profession and industry. The work again brings before readers many of the old-time members of the industry; and, in this connection, seeing that the original source of information concerning the proceedings of the central organization was the "Journal" (the "Transactions" have always been reproduced so far as the meetings are concerned from our columns), it may be claimed that Mr. Hastings is under some obligation to us for his early particulars. There was acknowledgment of this at the meeting in 1878 when Mr. (now Sir) Corbet Woodall was in the chair. We venture to extract from the review a reference by Mr. Hastings (which we appreciate) to the acknowledging incident on that occasion:

> Mr. Livesey [afterwards Sir George] addressed the meeting on the kindness they had received at the hands of Mr. W. B. King, the [then] Editor of the "Journal of Gas Lighting," and said it was their bounden duty duly to express their hearty thanks to him, for without his generosity the Association would have found before this that the half-a-guinea subscription was insufficient to meet their expenses. Mr. Woodall, in putting the motion from the chair, said they all felt such personal friendship and regard for Mr. King, and such interest in the work that he was doing, that it was very pleasant to see him among them. The motion was carried unanimously. Mr. King, in reply, said that it had been

his happiness to attend every meeting of the Association since the first gathering in Manchester in 1863; and he had personally reported the proceedings each year until now the state of his health prevented him from undertaking the labour. He was glad, however, to be present, and, with the aid of his friend, to continue his work. To the regret of every member of the Association, he was never with them again; for he passed away before the 1879 conference was held. His son (Mr. Walter King) succeeded him; and, so far as we know, he, like his father, has attended every meeting from that date to the present year.

May the present writer [not Mr. King himself] add to the foregoing, "with one exception, through illness."

There is one criticism of the work to make; and it is that it is a pity the technical part of the proceedings of the fifty meetings are reviewed chronologically. Chronological arrangement is all very well for a sketch of the general proceedings; but in regard to the technical history, it would have added to the intrinsic value of the review, if the matter had been subjected to separate treatment, and classified in respect of subject. As it is, we have a "glorious mixture" of technical subjects; and it will greatly depend on the character of the index whether effective relief is given from this condition. In places, the information as to technical contributions is very scrappy. As an example, in the review of the meeting held in 1868, when Thomas G. Barlow, the then Editor of the "JOURNAL," was President, we read: "Dr. Odling delivered a lecture on 'Some of the Constituents of Coal Gas;'" and "Mr. Thos. Methven proved the 'Necessity and Advantages of Regulation of Gas Consumed in Public Lamps.'" These allusions are not very satisfying in the information they present; and similar examples are fairly plentiful.

## PAISLEY AND ITS GAS SUPPLY.

### Fifty Years' Work of Mr. G. R. Hislop.

IT was a happy idea on the part of Mr. G. R. Hislop to commemorate the completion by him of fifty years' work as Engineer and Manager of the Paisley Corporation Gas Department by the preparation of a historical record of the undertakiing, which an equally happy inspiration had prompted him to dedicate to the Provost, Magistrates, and Councillors of the Burgh. What those with whom he has for so long a time been associated have done to celebrate the event, and to testify to the esteem in which their veteran Gas Engineer is held, will be found recorded in another part of this issue.

What is before us at the moment is the history of the Paisley gas undertaking which Mr. Hislop has compiled; and, as to this, it may be said that he has done his work as he seems to have done all else to which he has set his hand—thoroughly. Friends of the author into whose possession this well-got-up little volume may come will find among the very first pages an additional reason for treasuring it, in the shape of an excellent portrait of Mr. Hislop himself. The fifty years during which Mr. Hislop has been in charge of the works cover more than half the time over which the history of the gas supply of Paisley extends. The original Gas Company was formed in 1823; gas being supplied for the first time early the following year. A period of 22 years elapsed before the transfer of the concern to the Board of Gas Light Commissioners; and when this event took place, the first manager was still in office. As a matter of fact, there had been only three managers when, in the spring of 1865, Mr. Hislop was appointed to succeed Mr. William Foulis, father of the late Mr. William Foulis, of Glasgow.

Prior to this time Mr. Hislop had been manager at Coatbridge, at Lanark, and at Falkirk. He served for five years under the Board of Gas Light Commissioners, in terms of the Act of 1845, whereby the whole of the undertaking would in course of time become the property of the town by the redemption of the entire capital invested out of the surplus profits accruing annually. The terms of purchase were a premium of 60 per cent.; and until redeemed 6·4 per cent. per annum was to be paid. The redemption scheme provided for a relatively increasing representation upon the Board of the members of the Town Council as the capital was redeemed; so that, at the transfer to the town in 1870, there were four members of Council out of twelve constituting the Board of Management.

The beginnings of the gas supply of Paisley were small; the quantity of gas produced during the first year being a little over 5 million cubic feet, and the price charged 11s. 4d. per 1000 feet. That in the early days of gas lighting the value of encouragement as an aid to good service was appreciated, is shown by the following statement extracted from a report issued in 1836 by a Sub-Committee of Directors appointed to suggest measures calculated to promote the respectability and comfort of the workers and their families: "It was agreed to recommend that the Committee of Management take into consideration some mode of encouraging the well-behaved and industrious, either by premiums to such individuals, by pecuniary assistance in time of sickness, or by the formation of a savings bank, with perhaps 4 per cent. interest, which would be open to all in the employment of the Company." Passing on, it is noticed that in 1842 the manager (Mr. Archibald Cook) reported upon some experiments he had carried out with dried coal, and also with peat and tar for the production of gas; and he was instructed to purchase 100 tons of peat for the purpose of carrying out further investigations. The idea was that the peat should be steeped in the tar, and charged into the retorts; but the experiments were subsequently stated to have been unsatisfactory.

Shortly after the Board of Commissioners had taken over the works, a visit was paid to Johnstone to inspect a gas-exhauster, invented by the manager there—Mr. Blair, the father of the late Mr. William Blair, of Helensburgh. This was driven by the draught of the chimney; and in 1850 it was pronounced successful. Three years later, the first telescopic gasholder was erected, to contain 175,000 cubic feet. That the inauguration of this holder was an event, not only in the history of the undertaking, but in that of the town itself, is proved by the following: "After the holder was completed, an opening was left in the crown sheeting, and a gangway led to the bottom of the tank (22 feet deep), which was covered with boarding, while the interior was decorated with flags, and a banquet held therein. On the following night, a grand dance was given by the Gas Commissioners to all the officials and contractors, and kept up till morning." There was another dinner the following year—this time given by the contractors who had installed a new exhauster, invented by Mr. Wilkie, which consisted of an 18-inch pumping cylinder, and was driven by a table engine with fly-wheel and belt. This effected a saving of 15 per cent. in gas made. While on the question of saving, it is interesting to read that next year "the loss due to condensation and leakage reached the maximum of 30·65 per cent. of the gas made."

In 1870 the works were transferred to the Town Council; and the two following years they were largely remodelled and extended. Thus, from his early connection with the undertaking Mr. Hislop has had a busy time—he was, as already stated, appointed in 1865, when the consumption of gas was 55¾ million cubic feet per annum. His patent furnaces for re-burning spent purifying-lime were adopted in 1877, by which time the yearly consumption of gas had reached 107 million cubic feet, thus necessitating the erection of an additional telescopic gasholder of 640,000 feet capacity—a pretty large holder for those days. The record of extensions continues; and special mention is made [year 1878] of a set of four purifiers, each 36 feet by 30 feet, which "were at that time the largest in Great Britain, with the exception of the 40-feet round ones in the Beckton works of the Gas Light and Coke Company. It is added that "the size of these Paisley purifiers became the subject of a controversy, in the pages of the London 'GAS JOURNAL;' but the wisdom of their apparent extravagance in size has long since been fully acknowledged, and the principle universally adopted." When the Tay Bridge collapsed in the following year, the first telescopic holder, which was built in 1854, was blown down; but it was re-erected.

Another important stage in the history of the undertaking was reached in 1885, when, Mr. Hislop's patent regenerative system of heating the retorts having been installed, the fuel account was reduced by 40 per cent., with the result that the price of gas was lowered from 3s. 9d. to 3s. 4d.; the surplus profits being 1s. 1·36d. per 1000 cubic feet. In each of the three succeeding years the price was reduced a further 2d., making it 2s. 10d. per 1000 cubic feet. The next holder to be inaugurated was a 1½ million cubic feet one, in 1890. It was decided in 1896 to adopt Mr. William Young's oil-gas plant, upon the lines of a carburetted water-gas plant as opposed to the horizontal system; and two years later it was agreed by the Committee to supply prepayment meters to the small consumers. Other extensions came along; and then in 1901, after incandescent gas-burners had been adopted in some of the streets, the quality of the gas was reduced from 26 to 25 candles. Within the three succeeding years it was lowered to 20 candles, thus obviating the use of oil gas and cannel coal.

De Brouwer charging machinery and coal and coke handling plant were installed in 1906 and 1907; and since that time much other work has been carried out. A carburetted water-gas plant is now due to be installed; but the condition of trade and the cost of materials have made postponement a necessity. The make of gas, which in 1870 was 86 million cubic feet, was for the year ended May last 519½ million feet; while the loss from condensation and leakage has been reduced from 17·26 per cent. in 1865 to 6·93 per cent. this year, and in the same period the make of gas per ton of coal has risen from 10,047 to 11,748 cubic feet. The book value of the undertaking at May 15 last was £208,702, and the amount of loans outstanding £133,923.

A series of photographs fittingly concludes this souvenir of an interesting event in connection with the gas supply of Paisley.

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**Professor Lewes on High Explosives.**—In the course of his second lecture on "Modern Munitions of War," delivered last Wednesday before the Royal Society of Arts, Professor Vivian B. Lewes, dealing with high-explosive shells, said the material used for charging these was obtained from coal-tar derivatives. In distilling coal tar, carbolic acid was secured, which, under the action of nitric acid, yielded picric acid. The use of this was developed by various investigators; and subsequently Germany hit upon trinitrotoluol. Toluol was an aromatic hydrocarbon obtained from tar oils; and its yield depended upon the temperature at which the carbonization of the coal was effected. When the coal was distilled at high temperatures, the yield of toluol fell. He added that toluol, when nitrified, was a crystal which had the appearance of brown sugar; and specimens were exhibited of this and of trinitrotoluol pressed in the shape of small hard cylinders. Professor Lewes remarked that this was a beautiful explosive. Ammonal was trinitrotoluol mixed with a further proportion of nitrates, and was stronger than trinitrotoluol itself.

# EDWARD ALLEN.

WIDESPREAD regret in the gas industry and in the City of Liverpool, with which he had been closely associated all his life, is felt at the death last Thursday, in his 66th year, of Mr. Edward Allen, M.Inst.C.E., Chief Engineer to the Liverpool Gas Company. Always a busy man, he had lately taken on further work in connection with Government requirements—having been appointed a member of Lord Moulton's High Explosives Committee; and it is regarded as likely that the added strain imposed upon him by thus "doing his bit" for his country in its hour of trial, led to the breakdown in health which, after three weeks' illness, has now had a fatal termination. The sad event occurred at his residence, "Glentruan," Aigburth Road, and deep sympathy will be extended to the family in their sorrow.

Mr. Allen, who was born in Liverpool in 1850, was educated at the Liverpool Institute, and then, at the age of fourteen, joined the staff of the Liverpool Gas Company—serving his articles and receiving his training as a gas engineer under the late Mr. Alfred King and his son Mr. William King, the Company's Engineer. For some time he held the position of Resident Engineer of the Company's Linacre works, in the construction of which he was engaged; and in 1889 he was appointed Chief Assistant Engineer. It was upon the retirement of Mr. William King in 1904 that the Directors appointed Mr. Allen to the important post of Chief Engineer—a position he has since filled in a manner which has merited, and has received due recognition at the hands of the Board. He was, as Chief Engineer, responsible for many additions and modern improvements to the works and plant of the Company. Much of this plant, it will be recalled, was described in the pages of the "JOURNAL" in connection with the meeting of the Institution of Gas Engineers in Liverpool last year. Among other things, reference was then made to the "Dryco" system of coke cooling, in accordance with the patent of Messrs. Allen and Gibson (the present Assistant Engineer of the Company.)

Mention of this meeting in Liverpool takes matters down to what Mr. Allen himself must have considered as being one of the outstanding periods of his career; for that gathering brought to a close his year of office as President of the Institution of Gas Engineers, and a year of strenuous work on behalf of the gas industry. Following Sir Corbet Woodall in the chair, he was President during the time of that great co-operative effort, the National Gas Exhibition. And his connection with the exhibition did not end with his being at the head of the Institution; for he was at the same time, according to the then rule, President of the British Commercial Gas Association. As a matter of fact, it was no doubt due to Mr. Allen's initiation that the departure was made from constituting the President of the Institution of Gas Engineers President of the British Commercial Gas Association, and of going to the ranks of the Commercial Association for the purpose—the first President under the new order of things being Bailie Thomas Paxton, of Glasgow, who, in consequence of the war, still occupies the chair. In addition to being a member of the Institution of Civil Engineers, Mr. Allen was a Past-President of the Liverpool Engineering Society, before which body his Inaugural Address, which he delivered in the year 1910, was mainly devoted to the progress of his Company and of the gas industry generally.

Another fact which served to make 1914 an important year in the life of Mr. Allen was that he then reached his fiftieth year of service with the Liverpool Gas Company—an event which was signalized during the week of the Institution meeting by the presentation of a gold cup by members of the Council and Committees to Mr. and Mrs. Allen, "as a token of their personal esteem for the President, in commemoration of his fiftieth year of service with the Gas Company, and as a memento of the forty-first anniversary of their wedding day." Later in the year, his staff presented him with a set of entrée dishes, "as a token of their respect and esteem on the occasion of his completion of fifty years' service;" and advantage was taken of the opportunity to bear testimony to the kindness and consideration he had always shown towards those under his control, and to the warm regard and affection in which he was held by all the members of the staff. Reference was also made to the great improvements introduced by Mr. Allen in the manufacturing plant under his charge by the adoption of modern systems and labour-saving appliances, and to the great honours which had been so deservedly bestowed upon him in recent years. Subsequently these gifts were added to by the presentation by the Directors of the Company of a handsome silver candelabrum, "as a mark of their confidence and esteem, on the completion by him of fifty years in the service of the Company [1915]."

The idea of a central gas organization, started some years ago in the "JOURNAL" and subsequently followed up by Mr. J. W. Helps in his Presidential Address to the Institution of Gas Engineers in 1910, always had Mr. Allen's cordial support; and in a speech at the dinner of the Society of British Gas Industries, in March last year, he remarked that, though a scheme for the formation of a Joint Committee which would represent the whole gas industry was for the present in abeyance, the spirit of the movement was alive, and was very strongly in evidence. Mr. Allen's interest in the subject of illumination was apparent in the report which he presented at the annual meeting last January of the National Illumination Committee of Great Britain; and his views on testing were fully explained to Parliamentary Committees in connection with the "Standard Burner Bill," under which the Liverpool and other gas companies secured the adoption of the "Metropolitan" No. 2 burner for testing, and then again last year, when his Company obtained the calorific value in place of the illuminating power standard. As a matter of fact, the calorific power clause in the Act of the Liverpool Gas Company constituted the first deviation from the terms of the Gas Light and Coke Company's clause which was settled the same session. What was then done by the Committee thus created a precedent for variation in the case of companies in connection with which special circumstances could be shown as justifying some departure from what is now the model standard. Among other local work must be remembered the transfer of the Fazakerley Gas-Works of the Corporation of Liverpool to his Company, partly as the result of his negotiations with the Corporation for the settlement of their opposition to the Company's Bill. While, again, of a wider scope, may be mentioned his evidence last July, on behalf of the gas industry, before the Departmental Committee appointed by the Local Government Board to consider the question of Smoke Abatement.

In social and church matters, the loss of Mr. Allen will also be keenly felt, holding, as he did, very high positions in the Wesleyan communion. Football and music are stated to have been his recreations; and it is with truth remarked that, gifted with a wonderful self-control, his forbearance and tact secured for him much influence, which he always exercised for the benefit of others.

An editorial appreciation will be found on an earlier page of this number of the "JOURNAL."

## TWO APPRECIATIONS.

By EDWIN UPTON.

The Liverpool Gas Offices have assumed that muffled silence which portends sympathetic reverence where death has removed a personality of outstanding worth.

The passing of Edward Allen has brought with it sudden—

yea, and universal—loss; for does not the entire gas world suffer in the removal of an able leader, and the Institution by the deprivation of a talented colleague; while the public will no longer enjoy the services of one whose integrity, professional ability, and capacity for business rendered him practically indispensable? Only his family circle can realize to the full the great void his passing has created—because in business life the things of to-day change on the morrow—but to those mourning his loss there will come a comfort from the knowledge that, though dead, he lives in the hearts of all who knew him.

Edward Allen was endowed with great gifts, and possessed an active and winsome personality, as the writer can abundantly testify—having enjoyed the privilege of close association with him. Never was he known to utter an unkind expression; but, on the contrary, he had cultivated a genius for pleasing others, and in this lay his greatest reward. Endowed with wonderful self-control, forbearance, and tact, and aided by his high sense of honour, he readily secured great influence; but this he invariably consecrated to the good of others. Those who knew him are best able to appreciate his good works, which were distributed with a quiet, unostentatious grace. Of strongly democratic ideas, his sympathy was always given to the weakest side; and to remonstrate with him for unselfish generosity, only produced that irresistible smile by which one knew that the matter was closed, and further argument futile. For with him friendship pledged by hand endured for all time. In conversation, he made the seemingly complex simple. His active brain intuitively grasped the points, almost before they were given to him; and difficulties disappeared as if by the magic of his touch.

It is not given to a large number of men to enjoy the unbounded confidence with which he was honoured; and only a month since he had the satisfaction of hearing his Directors say, in regard to his fifty years of service: "It is not enough." His life will not be measured by the years he served, or by the time he lived, but by good deeds done; and it recalls some familiar lines by Robert Louis Stevenson—

> "Give us to go blithely on our business all this day, bring us to our resting beds weary and content and undishonoured, and grant us in the end the gift of sleep."

By R. E. Gibson.

To those who have been brought into constant and intimate contact with Mr. Edward Allen, his passing away is a great and irreparable loss. Mr. Allen was a man of outstanding personality and influence, and at once commanded the respect and esteem of those who had business relations with him. To know Mr. Allen well was to love him. His patience, his forbearance, his kind-heartedness were qualities which endeared him not only to the members of his staff but to all who knew him closely; while his energy, enthusiasm, and optimism were always an inspiration to others.

In engineering matters, Mr. Allen was most decidedly progressive. He would often go to a great amount of trouble to find out the value of new ideas. The works of the Liverpool Gas Company contain abundant evidences of his wise foresight and his great ability as an engineer.

In business affairs, his alert mind and quick grasp of facts enabled him to get through a great amount of work expeditiously and with ease.

Mr. Allen had remarkable tact in dealing with men; and, while always willing to benefit and assist the employees, he was ever true to the best interests of the Company whom he served so well and so long.

His assiduity in the performance of the new duties imposed upon him in connection with the High Explosives Committee were characteristic of his whole life. Mr. Allen had high ideals, and his patriotism was shown in the duties which came upon him in these later months, and which, in the opinion of many of his friends, involved the breakdown that terminated in his death.

His kind and genial presence will be sadly missed by a host of friends, and particularly by those who came in daily contact with him.

### THE FUNERAL.

The interment took place on Saturday, at Flaybrick Hill Cemetery, Birkenhead; the first part of the service being held in St. John's Wesleyan Chapel, Belvidere Road, Prince's Park, Liverpool. The funeral was very largely attended, and those present included many friends of Mr. Allen connected with the gas profession. The Liverpool Gas Company were represented by Mr. H. Wade Deacon, J.P. (Chairman), Mr. J. E. Tinne (Deputy-Chairman), and several of the other Directors, Mr. Edwin Upton (Treasurer), Mr. Theodore Garnett, M.A. (Secretary), Mr. R. E. Gibson (Assistant-Engineer), and a great number of employees from the different works and departments. The Institution of Gas Engineers, by Mr. John Young, of Hull (President), Mr. Samuel Glover, of St. Helens (Vice-President), and Mr. John Bond, of Southport (ex-President). The Manchester District Institution of Gas Engineers, by Mr. J. G. Newbigging, of Manchester (President), Mr. G. S. Frith, of Runcorn (Hon. Secretary), Mr. W. Whatmough (Heywood), Mr. T. B. Ball (Rochdale), Mr. J. W. Allin (Chorley), Mr. J. H. Crowther (Wallasey), Mr. Samuel Tagg (Preston), Mr. Tim Duxbury (Oldham), Mr. W. T. Duxbury (Atherton), Mr. F. Betley (Wigan), Mr. H. Hoy (Tyldesley), Mr. J. H. Davies (Oswaldtwistle), Mr. F. Sidwell (Winsford), Mr. J. A. Brentnall (Northwich), Mr. W. E. Roberts (Woolton, near Liverpool), Mr. R. G. Shadbolt (Grantham). The Society of British Gas Industries, by Mr. H. M. Thornton (Vice-Chairman), in the unavoidable absence of the Chairman (Alderman F. Templer Depree, J.P.), and Mr. F. J. West. The Lancashire Commercial Section, by Mr. S. Meunier, of Stockport (Chairman), and Mr. S. E. Halliwell, of Littleborough (Hon. Secretary). The Manchester and District Junior Gas Association, by Mr. Samuel Carter, of Garston (President), and Mr. John Robinson, of Altrincham (Hon. Treasurer). The Liverpool Engineering Society, by Mr. E. C. Given (President), and other officers. The Leeds University, by Mr. Hodsman; and the Liverpool University, by Professor W. H. Watkinson. Among other gas engineers who attended were Mr. William King (late Engineer of the Liverpool Gas Company), Mr. J. Fergusson Bell (Derby), Councillor Duxbury (Darwen), Mr. John Robinson (Manchester), Mr. T. O. Paterson (Birkenhead), Mr. R. H. Brown (Birkenhead), Mr. Evan T. Davies (Oswestry), Mr. A. G. Smith (Lighting Engineer, Liverpool), and Mr. Arthur G. Readdy (Hoylake and West Kirby Gas and Water Company).

In forwarding the names of the members of the Manchester District Institution who were present, Mr. G. S. Frith says: "The gas industry has lost an able and most enthusiastic supporter. Mr. Allen was liked and loved by all who knew him; and personally I shall always look back with pleasure on the days he spent on his visits to Runcorn—having been a lifelong friend of my father."

Melancholy interest attaches to the fact that this is the third death which has occurred during the present year among long-service officials of the Liverpool Gas Company; Mr. J. F. Robinson (who retired from the Treasurership in 1910, after 37 years' service) and Mr. P. F. Garnett (who was Secretary for 45 years) having died in February. With Mr. Allen's 50 years, the length of service of these three officers aggregates no less than 132 years.

## THE MARKET VALUE OF LIGHT OILS AND OTHER CONSTITUENTS OF TAR.

By Chariot and Urbain.

The finances of gas undertakings can be considerably augmented by adopting a process for extracting from gas into the tar a large percentage more of light oils in the process of gas manufacture than are usually contained in the crude tar.

The attention of the gas industry has been directed to this important subject by a very eminent engineer and expert in gas matters, who controls a large gas company in the South of London; and through whose pioneering instinct the process and its value has been made known to the gas industry. As the process opens-up a great number of collateral benefits, the industry at large owes to him its gratitude.

The best way to compare the benefit of this process, is to at once publish herewith, side by side, schedules showing from Durham coal, carbonized in horizontal retorts, the constituents and value of crude tar, and the constituents and value of tar produced, after it has washed the gas in properly designed plant, with the gas and tar at suitable temperatures, and other conditions for the best efficiency.

On reference to the tables [p. 121], it must be noted that the market values, placed against each constituent, are those which will be found in a recent edition of the "Journal," under the heading of "Current Sales of Gas Products," and where these cannot be found, an estimate of their values has been made. But it is most important that the vendors of tar should obtain the precise values from a competent impartial authority. Some constituents of tar vary considerably in price from time to time, according to the law of supply and demand. As an instance, naphthalene a few years since was absolutely valueless; but at the present time it is of considerable value. Anthracene, on the other hand, a while ago was of good value; but at present it is of little value. Creosote is rising in value.

It must be noted that Yorkshire or other coals will vary the composition of the crude and the treated tars, as will also the method of carbonization. In order to obtain the percentages of each market product, it is advisable to employ a competent practical consulting chemist who is thoroughly acquainted with the distillation of tar, and who has at his command a suitable plant, capable of distilling an agreed quantity, in order that this may constitute a practical test, and not be open to the accusation that it is only a laboratory test on a small quantity of tar. After the market value of the treated tar has been obtained, a reasonable allowance must be made to the distiller, in the case where this tar is sent entire to a tar distillery (if the gas undertaking does not possess one) for the cost of working, carriage, management, profit, &c. Gas undertakings are as necessary to tar distillers as tar distillers are necessary to gas undertakings. After the costs have been agreed with the tar distiller, the net value of the tar to the gas undertaking is thereby ascertained. The fees paid to the consulting chemist need not be costly compared with the quantity of tar sold, if samples of each consignment to the distiller are taken—one for the gas undertaking, one for the consulting chemist,

TABLE I.—*Crude Tar from Durham Coals per* 100 *Gallons* (*July*, 1915).

| | | | | |
|---|---|---|---|---|
| Ammonia (called 5 per cent. water) | | | = 3·00d. | |
| Benzol | 0·60 gallons at 11d. | | = 6·60d. | Light oils of average value 17·57d. per gallon. |
| Toluene | 0·15 | ,, ,, 3s. | = 5·40d. | |
| Solvent naphtha | 1·00 | ,, ,, 1s. 11d. | = 23·00d. | |
| Heavy ,, | 1·65 | ,, ,, 1s. 3d. | = 24·75d. | |
| Carbolic acid | 0·6 | ,, ,, 3s. 6d. | = 25·20d. | |
| Cresylic ,, | 0·9 | ,, ,, 1s. 3d. | = 13·50d. | |
| Naphthalene (28 lbs. at £12 per ton) | | | = 36·00d. | |
| Creosote oil | 30·6 gallons at 3d. | | = 91·80d. | |
| Anthracene (17·9 lbs. at ¾d. per unit) | | | = 2·25d. | |
| Pitch (750 lbs. at 23s. per ton) | | | = 92·00d. | |
| 100 gallons crude tar value | | | 323·50d. | |
| *i.e.*, per gallon | | | = 3·235d. | |

From this price of 3·235d. the working expenses, carriage, profit, &c., have to be deducted.

TABLE II.—"*Treated*" *Tar from Durham Coal per* 100 *Gallons* (*July*, 1915).

| | | | | |
|---|---|---|---|---|
| Ammonia (called 5 per cent. water) | | | = 3·00d. | |
| Benzol | 2·1 gallons at 11d. | | = 23·10d. | Light oils of average value 21·01d. per gallon. |
| Toluene | 2·1 | ,, ,, 3s. | = 75·6d. | |
| Solvent naphtha | 2·6 | ,, ,, 1s. 11d. | = 59·8d. | |
| Heavy ,, | 2·6 | ,, ,, 1s. 3d. | = 39·0d. | |
| Carbolic acid | 0·54 | ,, ,, 3s. 6d. | = 22·68d. | |
| Cresylic ,, | 0·82 | ,, ,, 1s. 3d. | = 12·30d. | |
| Naphthalene (28 lbs. at £12 per ton) | | | = 36·00d. | |
| Creosote oil | 27·75 gallons at 3d. | | = 83·25d. | |
| Anthracene (16·7 lbs. at ¾d per unit) | | | = 2·10d. | |
| Pitch (703 lbs. at 23s. per ton) | | | = 86·60d. | |
| 100 gallons of "treated" tar value | | | 443·43d. | |
| *i.e.*, per gallon | | | = 4·4343d. | |

From this price of 4·4343d. the working expenses, carriage, profit, &c., have to be deducted.

and one by the tar distillers' representative, either as agreed at the works, or on arrival at the distillery. These samples can be collected together, over a desired period, and of such quantity, as to amount to sufficient for a practical test, for each of the three parties concerned. In the case of small undertakings, this might cover a considerable period; and an arrangement could be come to between the undertaking and the distiller whereby a reasonable amount of cash credit could be given by the distiller to the small undertaking, in order to keep their finances correct, and until such time as samples had been tested, and the financial adjustment made. In the case where only the light oils are sent to the distillery, a smaller quantity of oils than tar would be necessary for each sample for test. The above arrangement will be perfectly equitable as between the gas undertaking and the distiller, because it is entirely controlled by the current market values, and both stand to gain or lose accordingly.

Certain constituents of tar are at times, owing to unusual circumstances, such as war, not readily marketable. For instance, at the present time pitch and anthracene are difficult, and large quantities of these are accumulating at the distilleries, and may continue to do so. But there will come a time when they will be considerably enhanced in value; and the gas undertakings should share in this advantage when it comes to pass. In some quarters, pitch, however, is being mixed with coke, coal dust, &c., and used as fuel for various purposes. No doubt the use of the pitch in this way could be extended.

Another method to rid the market of pitch and anthracene would be merely to strip the tar of its light oils—the residue being sold as dehydrated tar for road purposes, at an enhanced value. The surface of the country roads this summer are (in the opinion of those who should know) sustaining some considerable damage, possibly by the lessened contributions of the Road Board to the County Councils and other Road Authorities, so that the roads are not being sprayed to the extent they were last year. This is not for the want of the necessary labour, because, in many of the counties, numbers of men over the military age can be seen trimming up the footpaths, merely, it would seem, in order to give them employment. This labour would be ample for the tar-spraying of the roads. It should be the endeavour, therefore, of the gas undertakings and the distillers to urge upon the Road Board to make the necessary grants at once, so that the work can be carried out in suitable weather this season.

### HINTS AS TO THE PROCESS OF EXTRACTION OF LIGHT OILS.

Great stress must be laid upon the important part the temperature of the gas and tar play, at the time of contact in the extractor.

It has been ascertained that at 60° Fahr. the temperature of gas at the outlet of the extractor and efficient contact, the light oils down to heavy naphtha are greatly increased in amount. It remains to be ascertained to what degree the temperatures can be reduced, to obtain the best financial value from the gas and tar, and to what extent the composition of the gas is interfered with, in regard to its suitability for the consumers, as no doubt, from a financial point of view, it is better to recover from the gas its valuable constituents in a liquid form and sell the waste products in a gaseous form, with a corresponding reasonable reduction in the price of gas. In future, on this account, controlling public bodies should work more in harmony with the gas undertakings than hamper them, as they have done in the past. There is no information at present available as to what low degree of temperature all the benzene can be extracted by tar-washing; but it is known that practically all the toluene is being extracted at 60° Fahr. with good contact.

The proportions of naphthas, &c., are also increased in the tar; and it remains to determine in the future to what extent it is advisable to extract the latter. The best form of plant for the extraction of these light oils appears to be a tower-scrubber filled with wood grids of good open square mesh, arranged on the hit-and-miss principle—so presenting a large surface area covered with tar to the gas; and thus the tar circulated by a pump in its descent in the scrubber offers to the gas an excellent means for the extraction of the light oils. Moreover, no back-pressure is created by the passage of the gas, as is the case with the Livesey and rotary types of washer and many other types of washing apparatus. Where a Livesey washer is used, it is necessary, in order to obtain the maximum amount of contact, to make such arrangements that the tar must of necessity flow completely across the washer, entering at the bottom and overflowing at the top.

In some gas-works, the tar entering has been split into several streams, and has been caused to overflow on the opposite side down several branch pipes arranged at the same level leading into one pipe or overflowing a weir placed across the washer. It is necessary to have a froth of 6 inches depth or more, to obtain the best results. Little if any froth will appear on top of the tar, if any visible liquor is present—in fact, in any form of extracting apparatus, visible liquor must be rigidly excluded. Naphthalene is completely extracted from the gas when efficient washing takes place. Not only is this of great advantage to all gas undertakings, but naphthalene is a valuable product at the present time. Any measures taken to cool the gas for efficient light oil extraction have the advantage of making the ammonia plant more efficient for its size, and therefore in most instances allowing a portion of the plant to be used for light oil extraction without expenditure of further capital.

During warm weather, a ready means is usually at command at most works, in the form of water, to cool the gas and tar. Where the means at present adopted for this are not efficient to obtain the desired temperature, all exposed mains leading to the extractor can be sprayed by fine water-jets from as cool a supply of water as can be obtained. Little water need be used, as the process of evaporation very materially aids the reduction of the temperature; and, if necessary, even the extractor itself can be sprayed by this means. An easy method is to run compo. pipe along the top of the gas and tar mains; the compo. piping being pierced at frequent intervals, so as to allow small jets of cold water to fall on the pipes.

Another means of reducing the temperature of the tar is to put together with ordinary gas piping (using elbows, bends, &c.), a square or flat coil of not less than 2-inch pipe and even up to 4-inch. This coil can be immersed in a sealed water-tank. Cool water must flow in at the bottom; and the effluent water can be conducted away to the retort-house for coke-quenching or other purposes, so as to avoid waste. The tar should be run in from the top and out at the bottom, and as quickly as possible into the tar-washing apparatus.

Old hop sacking (which is cheap and convenient), if wrapped round the pipes and the extractor itself, and kept moist, is also a good method of reducing the temperature.

For the control of the temperatures, it is necessary to have thermometers fitted into the inlet and outlet gas-pipes of the extractor, and also in the inlet tar-pipe, as if the temperature of the gas on the outlet gas-pipe is not at the desired temperature, it can easily be ascertained whether the inlet gas or tar is at fault.

The quantity of crude tar to be used should be in the proportion of at least the amount of tar made per day to wash the amount of gas made per day; but where there is a large stock of crude tar, it is of decided advantage to use a greater proportion of tar.

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According to the "Iron and Coal Trades Review," the Ohio Railroad has experimented with coke-breeze, and found it satisfactory when used in connection with the stoking-devices installed on a number of locomotives. Coke-breeze, it is said, makes a satisfactory fuel for locomotives only when burned in engines equipped with stokers; and forced draught is necessary to get good results. It compares favourably with the low-grade coals sometimes used as locomotive fuel.

Messrs. Thomas Glover and Co., Limited, and Messrs. R. & A. Main, Limited, are working at high pressure on large Government contracts. A large number of the staff—including Mr. W. R. Glover and Mr. R. B. G. Glover—are serving with the Colours; and, in order to assist in the management of the works and expedite the carrying out of these contracts, Mr. Charles G. Clark, their Midland representative, has been temporarily appointed Assistant Works Manager. Before his appointment as Midland representative, Mr. Clark held, for a number of years, a responsible position in the engineering department of the firm, and this experience will be invaluable to him in rendering assistance in carrying out the requirements of the Government. In the meantime, Mr. William Batt will look after the firm's interests in the Midlands until circumstances permit of Mr. Clark's return.

# ELECTRICITY SUPPLY MEMORANDA.

THE new small unit lamps of the so-called "half-watt" class continue to furnish our electrical contemporaries with material for presentation to their readers. The question of the birthplace of the new comers has occurred to some people; and contrasting the statements made on the subject, inquirers are left in as much perplexity as they were before in regard to it. Having mentioned that the smaller sizes of these half-watts are argon-filled, the "Electrical Times" says they are made in this country—the "Osram-Atmos" at Hammersmith, the "Mazda" at Coventry, the "Wotan" at Dalston, and the "Ediswan" at Ponders' End. That is one statement. The "Electrician" remarks: "We gather from the literature which is being circulated on the subject that the new types of lamps are made in Holland, and are licensed for sale in Great Britain. They are imported under a British consular certificate that the lamps are of Dutch manufacture throughout." It is not for us to reconcile these two statements; this must be done by those concerned in putting the lamps on the British market. It was acknowledged at the beginning of the war by the General Electric Company that a large part of the capital of their lamp works at Hammersmith was German owned, but that this was due to the conditions associated with the acquisition and working of the patents in England. This raises the question as to whether the works in Holland which are turning out these small unit "half-watt" lamps of "Dutch manufacture throughout" are, in whole or in part, financed by German capital, or whether the "Dutch" works are paying anything in the shape of royalty to any German Company, so causing British buyers of the "Dutch" wares to indirectly trade with the enemy. The suggestion only occurs to us; we have no positive knowledge on the subject. But the matter is one of interest, and might be worth inquiry, as there is (or there ought to be) a deeply rooted feeling in the British electricity supply industry that it was high time it did something to effectually stop any resumption of its partial financing of Germany—directly or indirectly. We know that factories of various kinds have been set up in certain neutral countries by German capital; so making these neutral countries a shielding curtain for a little German export trade. Is this also the case with these small unit "half-watt" lamps? Or are they really produced on Dutch soil, by Dutch capital, without a penny piece of the profits going to Germany? If so, we compliment the Dutch manufacturers on their success in forestalling the Germans in producing the small unit "half-watt" lamps. It is, however, a case in which doubts are pardonable.

**Holland and the Small Unit "Half-Watts."**

We have been favoured with a copy of the "Lighting Journal and Engineer," which, we learn, is conducted by Mr. A. J. Greenly. It is described as being the "leading journal of the industry devoted to improvements in the application of electricity to lighting, heating, cooking, and ventilation." Having scanned the contents, we are of opinion that certain of the other electrical papers need not trouble to dispute the claim. There are other electrical papers that profess to be "oldest" among the electricals in some feature or other; but not one of them, so far as we have seen, arrogates to itself a supremacy in any other particular. Speaking of age, our own "JOURNAL" heads them all; for, to the best of our knowledge, it is the oldest technical and trade paper in existence, and of its great progeny, only the electrical papers occasionally refer to it in terms of disrespect. We suppose these intermittent lapses on their part are due to the fact that, with age and increasing responsibilities, the "JOURNAL" has advanced in activity and usefulness to the industry which it has served for some 67 years. However, this by the way. Although the Greenly conducted paper is the "leading journal" in the electrical industry, a boldly printed statement informs us that, owing to the war, it has been decided to publish fewer and more "representative" issues; and the scope has been extended to embrace heating, cooking, and ventilation—articles by "representative" authorities being included in the number before us. This reduction of issues does not speak of a golden prosperity.

**The "Leading" Electrical Journal.**

However, glancing at the contents of the "Lighting Journal," it is noted that the policy of electric undertakings increasing the price of electricity has been "dictated by stern necessity;" and "there is no doubt that it will be reversed as soon as normal times again prevail." What we have in the past known as "normal times" are not, we are afraid, going to return with any alacrity. Speaking of the Point-Five system, the "leading" electrical journal says: "The system is favourable by comparison with the average prices of gas which prevail up and down the country." On what ground is this statement made? It "*must* be so," says the concentrated wisdom of our contemporary, "otherwise the public would not be attracted to it." It is really not sufficient evidence of electricity, through the system, holding a superior position to gas in the matter of cost. There is no definite information in the article as to the extent to which the public has been attracted by it; while the Board of Trade statistics relating to the gas industry do show that its sides are continually bulking more and more through increasing numbers of consumers, and the growth of the consumption of gas. But we are not allowed by the "leading journal" to enjoy precedence in any way; for where the charges favour gas, it says, then "there is money value attaching to the cleanliness and convenience of electricity." What is there against the cleanliness, convenience, and thermal value of gas? We will refrain on this occasion from making a few comparisons that are not very acceptable to our electrical friends. However, we proceed to learn that the "Point-Fives" will in time absorb or convert all their rivals. They seem to be a long time about the job; and the resistance to conversion was rather strongly marked at the recent meeting of the Incorporated Municipal Electrical Association. [See "Memoranda" for June 29.] Another editorial is evidently suggested by an article by Mr. F. J. Barter Collis, on "Electric Lighting and Cooking on Trains." The editor of the "leading journal" says that "the evidence of Hawes, Aisgill, and Gretna fires is proof positive of the dangers of gas." Where is that "proof positive?" The editor had better seek advice upon the point from the "Electrical Review," which will tell him of its sorrowful experiences through prejudging matters, and through knowing nothing, or professing to know nothing, of the behaviour of gas under pressure when allowed unregulated escape. There is an article by Mr. John F. Shipley on "Industrial Electric Heating," one by Mr. W. A. Gillott on "Electric Cooking," and another on Electric Heating and Cooking by Mr. S. M. Hills—a gentleman who has maintained a discreet silence regarding the criticisms [in the "Memoranda" for April 20] of his paper before the Junior Institution of Engineers. Mr. A. H. Seabrook gives a brief "Survey of the Rise and Progress of the Point-Fives Association," which progress is only marked by twenty-three towns having a tariff somewhere in which 0·5d. is mentioned, which in all but one or two cases is not the average charge per unit for heating and cooking.

**Contents.**

Regarding the article by Mr. J. F. Shipley on "Industrial Applications of Electric Heating," this is the gentlemen who recently had a nasty fall through stating, at a meeting of the Junior Institution of Engineers, that there had been some dreadful experiences through the use of gas in a straw-hat factory at Luton. It turned out that Luton was not the town; and that the experience was one dating back some time. [See "JOURNAL" June 1, p. 502, and June 8, p. 594.] We invited Mr. Shipley to say where the factory to which he referred was really situated; but there has been dead-silence—discretion now being with Mr. Shipley in such a matter as this the better part of valour. Now he says: "The writer himself has observed the signs indicating partial poisoning from fumes arising from gas-burners used in industrial heating-irons." The girls "complained of sickness, and their cheeks were pale and puffy; and their work was done only listlessly. Obviously the air the girls were breathing was too hot, with too much carbonic acid, and *perhaps* a touch of carbon monoxide as well." We again invite Mr. Shipley to state where this factory is situated in which the puffy faced girls worked, and to send us a proper chemical analysis of the air which showed too much carbonic acid in it, and "perhaps a touch of carbon monoxide." Does Mr. Shipley think it manly to make a suggestion with the indefiniteness of a "perhaps" in it as to the presence of a poisonous gas, which he obviously wishes to be understood he attributes to the combustion of gas? Apparently he does not know that the factory inspectors see to it that the ancient and absurd prescription of the Factory Acts is observed—that the carbonic acid in the atmosphere shall not exceed 12 parts in 10,000 parts of air during daylight, and 20 parts in 10,000 during the hours of artificial lighting. In aërated water factories the men work in atmospheres containing as much as 300 parts in 10,000. In breweries the men tending the fermentation vats work for long periods in concentrations of carbonic acid of 0·5 to 1·5 per cent. These men have not pale and not in all cases puffy faces. Mr. Shipley should study modern scientific authorities on the subject, and he would find good cause for not setting his views in opposition to theirs. Men have been kept for experimental purposes in atmospheres containing 3 to 4 per cent. of carbonic acid (300 to 400 parts in 10,000) without being aware of the fact. We advise Mr. Shipley to begin educating himself on a subject of which he manifestly knows little or nothing by reading the article from the "Lancet" which appeared in our issue for July 6 (p. 39). He has, of course, never heard of thousands of factories in which heating in the manufacturing processes is by gas, and neither workers nor manufacturers would be without it. There is no trouble in these places; then why should there be in other factories?

**Want of Knowledge on the $CO_2$ Question.**

From the article by Mr. F. J. Barter Collis on "Electric Lighting and Cooking on Steam Hauled Trains," it is plain that there are electrical men who understand the problems and the difficulties governing the free application of electricity to lighting and cooking on trains who (though naturally they have a bias) are not so hysterically in favour as certain people who are less competent to judge, and whose painful shriekings over it are such as to excite pity. It is only to be expected that an electrician capable of rational talk, and yet at the same time desirous of putting forward the best possible concerning his own particular commodity, would say, as Mr. Collis does, that

**Train Lighting and Cooking Difficulties.**

electricity as it is generally installed on trains (24 volts) is safe, odourless, cool, and easily controlled. Having said this, he is obliged to acknowledge that it is not low-priced. The capital expenditure is "fairly heavy;" the dead-weight haulage is an appreciable factor; and the over-all efficiency—reckoned from the locomotive through the intervening dynamo and drive, the regulating apparatus (if any), and the battery or batteries—is not high. The cost of maintenance, even upon a comparatively high-priced installation, is probably not less than 10 per cent. per annum on first cost, and may be more if all charges are taken into consideration. From the point of view of economy, electricity makes a very poor showing. As to cooking by electricity, Mr. Collis has to admit—it being an obstinate fact—the low thermal value of electricity in relation to gas, which puts upon the current a heavy disadvantage when entering into the competitive field. There are also practical difficulties connected with the provision of the necessary generating, storage, and cooking apparatus. The lighting load of a main railway coach may be taken as from 15 to 17 amperes (say, 400 watts). This necessitates the employment of a dynamo having an output of about 25 amperes at 24 to 36 volts—say, an average of 750 watts—while the capacity of the battery installed may be such as to sustain the full lighting load for six hours. Suitable controlling or regulating gear will also be needed. Mr. Collis estimates the power requirements for cooking a full-course dinner for a large number of passengers at 1 kilowatt-hour per head. From this it will be appreciated that the size and cost of components capable of providing the necessary current for cooking would be large, and, further, that since the conversion efficiency of mechanical power into current is low, the additional tractive effort imposed on the locomotive might be so serious as to be even prohibitive. Yet Mr. Collis says "there is an immediate demand, *whatever it is worth*, for safety first, and the total suppression of gas." He does not say whether he joins in the demand. The italicized words suggest that he does not. He knows full well the large amount of hypothesis and imagination that has been forced into this discussion by loud-mouthed electricians, who harbour the view that gas released from cylinders at high pressure lingers round about the wreckage of a train in order to help in the conflagration, and considerately provide a case for electricity. But the same persons conveniently forget to agitate for the abolition of incandescent fuel under the locomotive boilers, of the use of combustible wood in the construction of the coaches, and of the employment of lubricating oil upon them, all which contribute to conflagration. They overlook, too, the heavy toll of life through electrical operation in industries and mines.

**Electric Cooking Data.**

Some interesting data on the subject of electric cooking appear in the article by Mr. W. A. Gillott, of the Newcastle Electric Supply Company, Limited; but the value of the data is diminished by the ever-missing factor in contributions of the kind—the amount of work done. The author puts the quantity of electricity consumed for cooking in a household of six persons at an average of 35 to 40 units per week; but as this includes the baking of bread electrically, we venture to think the figures should be placed on the minimum line. Employing coal for water-heating and warming the kitchen, and (when required for these purposes) boiling vegetables, soups, &c., Mr. Gillott found that, in 1913, the consumption of electricity in his house worked out to 4629 units—divided as follows: Heating, 2130 units, cooking 2129 units, lighting 370 units. The house has six rooms, kitchen, &c., with an electric-cooker, two kettles, iron, shaving-pot, and three radiators, with a total load of 15 KW. There were four adults and two boys in family. The total cost for lighting and heating worked out as follows:

| | | | |
|---|---|---|---|
| Fixed charge . . . . . | £3 | 0 | 0 |
| 4629 units at ¾d. . . . . | 14 | 9 | 4 |
| | £17 | 9 | 4 |
| Less 5 per cent. discount . . | 0 | 17 | 6 |
| | £16 | 11 | 10 |
| 4 tons of coal . . . . . | 4 | 0 | 6 |
| Total . . . . . | £20 | 12 | 4 |

During the year ending March, 1915, in a different district, Mr. Gillott used for electric cooking and heating only 3270 units. The coal consumed was the same; but the total load of the electric apparatus in this instance was only 11 KW. There was also one adult less to cater for. In regard to the total of £20 12s. 4d. in the foregoing table, it may be said that in the larger house of the writer of the "Memoranda" the account would be deemed high, yet the use of gas (at 2s. 2d. per 1000 cubic feet) is not stinted. The fixed charge, too, of £3 is low; and although the units are charged at ¾d. per unit, instead of ½d., the average cost (including the fixed charge) for lighting, heating, and cooking is only 0·905d. per unit. How many electric undertakings could afford to do all their domestic business on a flat-rate for every purpose of 0·905d. per unit, which figure would further diminish as the number of units consumed increased? This is not the price that all the company's business is done at, nor is it the price which produces the bulk of the profit for the shareholders.

**Wicked Thoughts.**

Our dear friend, the "Electrical Review," has some wicked thoughts—so wicked that it admits they will not bear publication. It is an admission of moral degeneracy. The wicked thoughts arose over the upshot of a decision by the Finchley Borough Council to adopt electricity for lighting some workmen's dwellings. Tenders were invited for the installation work on the first hundred houses. The lowest of 29 tenders was £686 or £720 for alternative systems, in addition to which there was the Electricity Department's service charge of £19. By dividing the lowest tenders by 100, our contemporary arrives at the fact that the lowest-tendered price means between £7 and £7 10s. per house, entailing for a fifteen years' loan annual repayments of about 13s. per house. Would those responsible for our contemporary care to live in a house wired for less than that amount? We trow not. On the other side, the local gas company offered to lay the connections and carcass all the first 100 houses *free of charge*, in the event of the Council deciding to install gas there; but with the condition that, if the Council supply electricity to any of the dwellings within five years, they shall pay to the Gas Company 10s. for each house so lighted. The responsible Committee made a close scrutiny of the position, and put the free gas piping alongside the £7 to £7 10s. for electric wiring; and then they looked at the 10s. penalty to be paid to the Gas Company in the event of the Council changing their minds, and preferring waste to economy. The conclusions arrived at were that the Gas Company's offer was indisputably cheaper than the lowest electrical offer, that it relieved the Council of all financial obligation, and that the Committee had no option but to decide in favour of gas. The "Electrical Review" says its last information goes to show that the Council have been considering the report of the Committee *in camera*. Then follows the confession of degeneracy: "Some thoughts will not bear publication." We are surprised.

## BRITISH DYESTUFFS.

It was announced in the Daily Press last Tuesday that British Dyes, Limited, had already established a research department, with Dr. G. T. Morgan, F.R.S., F.I.C., at its head, and had appointed a Technical Committee, consisting of him and three colleagues, of whom Dr. M. O. Forster, F.R.S., F.I.C., had been nominated Chairman of the Committee. One member of the Technical Committee has, we believe, had considerable experience in the laboratory of a firm who have manufactured coal-tar dyes for many years past; and if the Company are able to secure nearly the whole-time services of their Technical Committee, and give them a considerable number of qualified chemists as assistants in research work, we are glad to think that the research department of British Dyes, Limited, should shortly prove of as great value to the Company as the corresponding departments of the great German dye-producing firms have proved to them. We cordially wish Dr. Morgan and his colleagues all success in the work they have undertaken. The results will have a far-reaching influence in deciding the question of establishing research laboratories by the Boards of many other of the industrial undertakings in Great Britain.

British Dyes, Limited, have also resolved to appoint an Advisory Council, under the chairmanship of Professor Meldola, D.Sc., F.R.S., F.I.C., and have invited thirteen professors to join him and the members of the Technical Committee as members of the Council. It appears to us that an Advisory Council of eighteen members is unwieldy, and there is far too great a preponderance on it of the academical branch of the chemical profession. We hope, for the success of the work of the Council, that professors who have merely been invited to join it because they hold the premier chairs in our principal universities and colleges will decline the invitation, unless, like the Chairman, and Professor A. G. Green, M.Sc., F.R.S., F.I.C., Professor W. H. Perkin, Sc.D., F.R.S., F.I.C., and one or two others, they have special practical knowledge of coal-tar colours. The reduction in numbers which we trust will thus be effected would admit of the appointment to the Council of one or two men who have made a special study of the subject, but whose life work has not necessarily trended in the direction of academical chairs and Fellowship of the Royal Society. A less unwieldy and more utilitarian Advisory Council would thus be secured to the lasting benefit, we fully believe, of British Dyes, Limited.

The development of the synthetic dye industry in this country should undoubtedly create a demand for text-books dealing with this branch of chemical technology, if only for the guidance of students who contemplate passing into the laboratories of synthetic dye works. It is true that the existing treatises and dictionaries of organic chemistry, technical journals, and patent literature contain all the information on the subject which the author of a text-book would feel at liberty to publish, even though he had inside knowledge of the industry; but this information is scattered, and the student may reasonably expect to find it extracted and co-ordinated in a single manual. We have before us a small volume, to which the names of four authors are attached, which comprises extracts, with additions, from a more comprehensive treatise on industrial chemistry, brought together with the object of furnishing a manual on "Dye-Stuffs and Coal-Tar

Products."* The aim is a good one; and we do not doubt that the appearance of this book will stimulate other authors and publishers to efforts in the same direction.

The four authors do not appear to have collaborated in all sections of the volume, since three of the eight chapters afford evidence of individual—though undeclared—authorship. There is great difference in the merit of these chapters; and it seems a pity that credit cannot be allotted where credit is due. On the other hand, we are not surprised that the writer of an appendix on the "Preparation of Organic Compounds by Electrical Processes" preferred to sink his individuality in a tetrad.

The first chapter of the book gives a brief sketch of the "Industry of Coal Tar and Coal-Tar Products," including some statistics of production, import, and export of some of the more important products. We regret to see that the distinction, which is perfectly clear in English, between benzol and benzene, toluol and toluene, &c., has not been observed by the authors, who have evidently been led into confusion by the common German usage of the words benzol, toluol, &c. Incidentally, we may observe that the specific gravity given for benzene—viz., ·839—is so much in error that hardly any reader will be misled by it. We do not know what grounds the authors can have for the statement that coal-tar pitch is used "to a certain extent for paving streets, &c.—the natural asphalt being, however, both cheaper and better for the latter purpose." If this be true, why do road authorities use more and more pitch each succeeding year?

The second chapter, on "Industry of the Synthetic Colouring Matters," is the longest, and perhaps the most useful, chapter in the book. It gives references to the principal authorities on the subject, and also to patent literature. In regard to patents, however, it must be borne in mind that many specifications relating to synthetic dyes have been drafted with a view to misleading potential competitors rather than for securing direct protection for the inventions which they purport to disclose. In order to combat this evil, it would appear reasonable to require patentees, in return for the protection which they obtain for any real invention, to refrain from patenting spurious processes, under penalty of forfeiture of whatever patent rights they hold.

The third chapter is a very brief one, on "The Industry of Natural Dye-Stuffs," and, like several other chapters, exasperatingly often refers the reader, for the very information he would reasonably expect to find in it, to other parts of the larger work from which this manual is extracted.

The next chapter gives an outline of the dyeing and colour printing industry, on which there are, of course, several standard handbooks in the English language. Nevertheless, it is appropriate that a chapter such as this should form an adjunct to a manual dealing primarily with the synthetic dyes themselves.

"Inks," the subject of the brief fifth chapter, has also been dealt with in standard English handbooks.

One page dealing with "Saccharine and Other Artificial Sweetening Chemicals" is dignified with the heading Chapter VI.

The seventh chapter relates to "The Industry of Modern Synthetic Drugs," which may be regarded as being an offshoot of the synthetic colour industry, since it has developed in conjunction with the latter, and is more or less dependent on it for some important raw materials. It appears to be solely the work of one of the four authors, and, though brief, is one of the best chapters in the manual.

The eighth (and last) chapter, on the "Industry of Photographic Chemicals," also appears to be solely the work of one of the four authors.

The manual covers ground which is not, to our knowledge, covered by any single manual previously published in the English language; and on this account it should find a goodly circle of readers.

* "Dyestuffs and Coal-Tar Products, Their Chemistry, Manufacture, and Application, including Chapters on Modern Inks, Photographic Chemicals, Synthetic Drugs, Sweetening Chemicals, and Other Products derived from Coal Tar." By Thomas Beacall, B.A. (Cambridge); F. Challenger, Ph.D., B.Sc.; Geoffrey Martin, Ph.D., M.Sc., B.Sc.; and Henry J. S. Sand, D.Sc., Ph.D. [Reprinted, with Additions, from "Industrial and Manufacturing Chemistry," Vol. I.] London: Crosby Lockwood and Son; 1915.

## TWENTY-FIVE PER CENT. STANDARD SULPHATE.

### An Argument in Favour.

THERE are makers of sulphate of ammonia who still hold back from the production of 25 per cent. sulphate of ammonia, and who, in defence of their customary practice, advance all manner of argument for the retention of the 24 or 24½ per cent. quality. It is all a question of the correct policy. They think their policy is right; many others who have extensive experience as makers and sellers, and some of whom are directing the work of the Sulphate of Ammonia Association, think otherwise, realizing well that a new standard of requirement has been created—the 25 per cent. standard—which must now and in future be complied with. Individual opinions in a matter of this kind are based on various grounds. Cost of manufacture and other questions arise. But the ultimate ground for decision is furnished by the buyer of the produce. If his requirements are not satisfied by one producer, they will be by another; and the one who does not give what is needed must eventually go to the wall.

The Sulphate of Ammonia Association have had difficulty (and in cases they have not yet been successful) in converting some makers from their old ways to the new—from the production of the lower quality material to the necessary higher quality. They have now issued a pamphlet which all producers should read, and which is convincing as to the complete dominancy of quality to-day in the sulphate of ammonia markets of the world. The pamphlet is practical in its argument. The consumer's point of view—which is the chief one—is first presented. Some makers agree that, for the export trade and competition abroad, a 25 per cent. quality is requisite; but for the home trade the lower quality sulphate can be supplied with advantage. But is the British farmer so short of intelligence that he will continue to be satisfied with a quality less than that which his equals abroad consider necessary, and find the best? We think not. The pamphlet supplies illustration as to the effect of experience. A southern British farmer last year could not get a supply from the local gasworks of the 24½ per cent. sulphate of ammonia to which he had been accustomed, and so he purchased a guaranteed 25 per cent. sulphate from a neighbouring gas-works. The following year he placed his order again with the makers of the 24½ per cent. quality. Delivery was followed by complaint. The farmer said that last year he had had no difficulty in applying the sulphate with his drills, whereas this year the salt was moist, clogged the drills, and the lumps had to be broken up before the material could be applied, which involved a considerable amount of labour. He therefore insisted on having the same quality as last year. The moral of this is clear. Experience will assert itself at home, and gradually, as it has done abroad, reduce the limits of the field within which there can be disposal of the 24 and 24½ per cent. sulphate. America compels a 25 per cent. quality; Spain is not so particular, because the consumers buy on delivered weight. The experience, however, of merchants shows that it pays to send 25 per cent. sulphate of ammonia even to Spain, owing to the large saving in loss of weight. The Sulphate of Ammonia Association are convinced that, if makers had sold direct to Spain on delivered weight, they would long ago have adopted a higher standard in self-defence; for losses in weight on the 24 and 24½ per cent. shipments, often amount to 2 or 3 per cent., sometimes more.

Special attention is drawn in the pamphlet to the necessity of sending out sulphate of ammonia in good mechanical condition. As a rule, good makes testing 25 per cent. ammonia or more, and containing about 2 per cent. moisture and ¼ per cent. free acid, are in a fine granular state ready for immediate application to the soil. This is a selling advantage. The question of bagging is also dealt with, which brings us to the makers' point of view, and to the "battle royal" that there has been between the makers of the two qualities. Owing to the various and interacting factors that almost day by day influence prices, it is impossible to settle the controversy on the basis of relative market prices. The 24 per cent. men say that it will cost something extra to make 25 per cent. sulphate; and they do not see that there will be any gain to compensate for the additional cost. The matter is argued in the pamphlet; but the salient part of the argument, in our opinion, is where it is pointed out that the past is no criterion for the future. Just as the War Loan has set up a new standard for capital and in the Money Market, so has foreign competition with British sulphate of ammonia set up a new standard of quality. Until German and American sulphate of ammonia, guaranteed at 25 per cent., came along, it would not have paid the British manufacturers to have made a 25 per cent. quality. But this competition is a big factor; and we have the case put into a nutshell:

> The conditions in the trade have changed entirely during the last few years. The supply of 25 per cent. sulphate of ammonia has increased enormously, and with it has increased the demand for it. About *half* the world's production of sulphate is now sold on a 25 per cent. basis; and it is certain that in the near future, owing to the large increase in the German output, *a still greater proportion* of 25 per cent. will be available. Synthetic sulphate of ammonia will shortly be produced at the rate of 300,000 tons per annum, so that the output of Germany will be about 800,000 tons.

The march of the higher standard will continue; and the wordy arguments of makers will not stop it The lower qualities will have to come into line with the higher standard—sooner or later; the sooner the better for the reputation of British makes. The Association urge upon those who propose delaying the change until after the war is over, the immediate conversion of their practice from the lower to the higher quality. We read:

> The present moment is the right time to change. The sentiment of the world is overwhelmingly anti-German; and British manufacturers will undoubtedly obtain a preference if they can turn out a quality equal to German sulphate of ammonia. At the present moment, many overseas consumers who had been regular buyers of German sulphate of ammonia, and had made fresh contracts with Germany before the war, are receiving British salt instead. Only about 10 per cent. of British sulphate of ammonia tests 25 per cent., so that very many of the buyers must be making comparisons which are anything but flattering to our salt. It would give our merchants an enormous advantage over the Germans if they could go to foreign buyers now and say: "At the present momont, we are the only exporters of sulphate of ammonia; if you want sulphate, you must therefore come to us. But we are not going to sell to you now unless you give us an undertaking to give us the first refusal of all your business after the war is over. As far as quality is concerned, we can now supply you with 25 per cent. sulphate of ammonia, fully equal to, if not better than, German salt; and we can guarantee that the bulk of the British production will henceforward test 25 per cent. so that you need not be afraid about

supplies." In this way, merchants could do much now to consolidate our position in the foreign markets. It rests with the British manufacturers to enable the merchants to take this step, by providing a large supply of 25 per cent. salt immediately.

As to the cost of making 25 per cent. quality, this must vary according to the plant employed. The pamphlet points out:

It may be safely asserted that there are very few makers in this country who already employ centrifugal driers who could not raise their production to 25 per cent. standard at a trifling cost. In a great many cases, the extra cost merely means a little extra labour in turning over the heap of salt. The problem of making 25 per cent. resolves itself largely into well-whizzing the salt, and careful regulation of the saturator.

The Association now supply expert advice free to members; and their expert is at command for giving practical demonstrations on the spot.

Those sulphate of ammonia makers who have not yet become converted to the higher standard, should read the full cogent argument presented by the pamphlet. If it does not entirely turn opinions, we feel convinced that it will do something to undermine their stability; and this will be something to the good, as helping to the consummation devoutly hoped for of the final collapse of those opinions, and which collapse prudent thought for the future demands.

## THE SOUTH SUBURBAN METER-RENT MISTAKE.

### Withdrawal of the Circular.

THE agitation over the meter-rent circular of the South Suburban Gas Company [*ante*, p. 69] increased last week—a ratepayers' meeting was held; local newspapers discussed the matter; the Company found the flow of inquiries was swelling. We know, too, that, though a considerable number of the agreements to pay 6s. a year instead of 3s. for meters were signed and posted, there was a by no means small number of those who appended their signatures to the circulars who afterwards wished they had not done so; the feeling growing (as it would do among outside people) that this was an instance of a large and powerful Company making an effort to—although the sum per individual consumer in the old South Suburban area only represented 3s. per annum—squeeze something more out of the consumers, supplementary to the increase in the price of gas that had been necessitated owing to the conditions imposed by the war. The Company have in consequence of the storm raised been upon the defensive; and the Secretary (Mr. Wilfrid Wastell) has been "interviewed" by a representative of one of the local papers, and has appeared as spokesman for the Company at a ratepayers' meeting.

It appears that the system of meter charge that has had application in the case of the old South Suburban Gas Company from quite distant times has been a flat-rate of 3s. a year for all sizes of meters. A flat meter-rate does not appeal to us as being fair; and it has only one other example in the neighbourhood of London, and that is at Croydon, where the flat-rate is 4s., and not 6s. as proposed in the case of the South Suburban Gas Company. If a meter-rent is justified at all (and, of course, it is), then the rent, as we held last week, should have some relation to the expenditure incurred in respect of the different sizes of meters; otherwise no real basis exists for the rent. On most other things for which payment is made by way of rent, there is graduation according to the capital and other costs associated with the article, house, or whatever else it may be. To say that the small rent charged to the man with the large meter is fair because he deserves the consideration owing to his consumption of gas being larger than that of the man with the 5-light or 10-light meter is a queer contention. Such tender regard for him suggests, to follow the argument to its logical conclusion, that the larger the meter the nearer to vanishing point the rent should be brought. Consideration in respect of gas consumption should be based upon the quantity of gas consumed, and not upon the "rent" paid for a meter. The matter of a flat or graduated meter rate would not have arisen for mention were it not that the Company point out that the flat-rate of 3s. per meter has not, and does not, pay them In respect of the old South Suburban area, contentment by the Board with the existing condition of things was long-lived. Had this not been so, the Board would have made an alteration before the fusion with the Bromley and West Kent Gas Companies. If there was loss in the old South Suburban area, it follows that it was not due to the rent paid by the smaller meter users, but to the lowness of the rent paid by users of meters of large size, and therefore more costly. While saying this, we are not at all suggesting that a condition of things should be altered now that has subsisted so long.

Having substantially raised the price of gas owing to war conditions, the Company issued the circular proposing to double the flat meter-rent—making it 6s. for all sizes of meters throughout their district. The time, it is now admitted, was not the best one for doing this. What were the inducing motives? There is the statement as to loss on the meters. But there is something else. In the West Kent and Bromley districts, graduated meter-rents are the rule; and in the West Kent area, the rents have erred on the high side. By bringing the rents down to a flat-rate of 6s. in the two areas, the consumers, taking them as a whole, benefit, and naturally are quite willing to sign the new agreement. In bringing down the meter-rents to a flat-rate in those areas, the Directors did not want to add to the Company's "losses" from this branch of revenue; and so they came to the benevolent decision to launch the burden on to the old South Suburban consumers by the simple expedient of doubling their flat-rate, which would nicely adjust matters, and give the Company a few hundreds more than they had been receiving from meter-rents before. The scheme is worthy of the ingenuity of a notable Chancellor of the Exchequer. Why should the consumers of gas in the old South Suburban area be so charitably inclined as to pay the money required for the relief of the consumers in the recently annexed areas. We do not remember that the South Suburban consumers at the time the amalgamation with the two neighbouring Companies was spoken of were told that one of the benefits that would accrue to them would be the felicity that they would derive from paying extra in order to give meter-rent relief to their new connections.

Another point that is made by the Company is that the advantage to them from the levelling up and down to a flat-rate of 6s., would only amount to about 0·1d. per 1000 cubic feet over the whole sale of gas. Compared with what? The whole condition of things, or after deducting a sum representing the "losses" under the flat-rate of 3s.? It is not a question of what the gain would be over the whole output of gas, but what it represents upon the consumption in the old South Suburban area. Three shillings extra for meter-rent in that area means that the ordinary consumer who uses 36,000 cubic feet of gas a year will pay 1d. per 1000 cubic feet more—not merely 0·1d. more, those who consume less something more, and so in proportion; while the Directors have a very sympathetic eye upon the man with the large meter who is allowed to have it at the same price as the man with the small meter. In the days before the war, there was great rejoicing on the Directors' side of the table, and the proprietors applauded, when the Chairman was able to announce a reduction in the price of gas by 1d. per 1000 cubic feet.

But further comment is not required for a single and sufficient reason; and what has been said on behalf of the Directors in defence of their action requires no further criticism for the same single and sufficient reason—

The Directors have withdrawn the meter-rent circular; and the consumers in the South Suburban area will continue to pay 3s. per meter per annum, as they and their predecessors have long been doing.

## THE NEW GAS-WORKS AT BUDAPEST.

By M. ISIDOR BERNAUER, the Manager.

**[Abstract-Translation of a Description in the "Journal für Gasbeleuchtung" for May 8, 15, 22, and 29.]**

(*Continued from p.* 78.)

STATION METERS AND GOVERNORS.

THE gas travels from the purifiers to the station meters in three 36-inch mains. The meters and governors are housed in a building 177 feet in length and 78 ft. 9 in. in width. Included in the building is also the plant for introducing air into the gas before purification.

There are three meters, working on parallel streams of gas, each capable of passing 212,000 cubic feet per hour. These are the first meters of so large a size on the Continent, and special care had to be given to the construction both of the casing and of the white metal drum, on account of the high water pressure and the high speed of the periphery of the drum. The meters are 19 ft. 8 in. in diameter, and the cylinder is 20 ft. 5 in. in length. The inlet and outlet connections are 36 inches in diameter. The cast-iron casing is constructed of 24 curved plates for the cylindrical part and 14 flat plates for the ends. The plates of the sides have milled flanges, with a special caulking hammered in; those of the ends have deep milled flanges, packed with red lead, and firmly held together by screws. The cylindrical casing is strengthened by the insertion between the middle flanges of a wrought-iron ring; the ends being stiffened to resist the great pressure of water by the insertion between the flanges of flat iron plates, 13¾ inches wide and 1⅜ inches thick. The whole casing is further stiffened by numerous longitudinal and transverse ribs, to enable it to withstand without distortion the pressure on all sides of the 24,200 gallons of water which it contains.

The drum is constructed of white metal, in four chambers. All the walls are strengthened by T and angle iron, and all wrought iron used in the drums is very heavily galvanized. The drum centre or cross is of cast steel, and is firmly keyed on to the steel axle. Each chamber is made accessible by a manhole corresponding with the openings in the casing. The lower part of the casing is made by plates into a sludge chamber, to which a discharge valve is fitted. At the back are the inlet and outlet connections, with bye-pass valve, all 36 inches in diameter, with water supply, King's overflow, and water level gauge. Both bearings of the axle of the drum are inside the casing, and are provided with an arrangement for lubricating them from outside. The revolutions of the drum are transmitted by toothed wheel gearing, through stuffing boxes, to the indexes on the face of the

meter. The joints on the front of the meter are covered by ornamental bands; but the chief ornamentation is a griffin and a lion supporting the arms of the City of Budapest. The record of the meter can be read at any time in Arabic figures on a dead-beat recorder. The meter is also provided with a registering apparatus which prints the reading every hour on a strip of paper, which is removed every day and preserved. A clock dial in the centre of the face of the meter is coupled with the registering apparatus, and the hands are driven from transmission gearing brought to all three meters from a large outside clock; so that the records of all three meters are registered at precisely the same time.

The installation of governors comprises relief or bye-pass governors between the inlet and outlet of the gasholder, an initial governor, and the distributing governor. The principal relief governor has 40-inch connections, one of which communicates with the inlet and the other with the outlet of the gasholder. The inside of the governor bell stands under the pressure prevailing at the outlet of the gasholder, and the outside is under a constant pressure of say 16-10ths. Should the pressure at the outlet fall considerably, owing to any wrong manipulation of valves or other reason, the bell falls and thereby operates the valve, causing it to open and allow gas to pass from the inlet of the holder to the outlet main until normal conditions of pressure are restored. An auxiliary relief governor attached to the gasholder inlet is set to open when the pressure there rises above (say) 12 inches. When it opens, the gas pressure operates a valve which allows gas to pass direct from the inlet main to the outlet main of the gasholder until the pressure on the inlet side falls again to normal. These governors, therefore, serve to prevent any interruption in the supply of gas to the district, and to avoid any dangerous rise of pressure on the inlet side of the gasholder causing back-pressure on the system of works apparatus.

The initial governor has 32-inch connections, and is of the usual type, with a bell operating a throttle valve. It is loaded with weights to give the desired pressure on the outlet, and its object is to control the pressure of the gas entering the more sensitive distributing or district governor. The latter is on Müller's system, and is automatically loaded with water to control the distributing pressure within set limits. It has 32-inch connections. The automatic control depends on the flow of water through a syphon tube, which connects an annular cup on the outside of a tank with a cup on the top of the bell which floats in this tank. The bell, which is of white metal, is attached by a central spindle to the valve disc, which moves up and down the cone of the governor. In most patterns of governor loaded with water, either a continuous supply of water or a complex train of levers is necessary; whereas in the pattern here adopted only the water lost by evaporation has to be made good about once a week, and there are no levers or other train of mechanism.

The air delivery plant comprises three blowers with air-meters. The blowers are driven by engines directly coupled to them, and a safety bye-pass is provided by which air is returned from the pressure side of the blowers when too much air is being pumped. The air supply to the blowers is taken from outside the building through a main which has its mouth about 7 feet above ground level, and has a number of wire gauze screens to hold back dust. The compressed air passes out through two 6-inch pipes, with non-return valves to prevent gas passing back through them, and through two meters by which the volume is measured.

The house also contains two gauge boards, on which the pressure in different parts of the train of apparatus is shown, and a Crosley pressure recorder which indicates and registers the pressure in the distributing main. The latter pressure is also shown on an indicator, with magnified scale, attached to the distributing governor.

### Gasholders.

The two gasholders are each of 3,530,000 cubic feet capacity, in four lifts. In order to keep the cost of the foundations as low as possible, having regard to the soil being partly silt and partly made-up, the lower edge of the tank was put only 10 ft. 6 in. below the level of the ground, and the soil was sloped away round the holder to its angle of repose. The foundation consisted of a 10 to 13 feet layer of gravel well filled with thin clay; the top being a 4 to 10 inch slab of concrete.

The tank is the heaviest item in the cost of large gasholders according to the usual mode of construction, in which the steel cylindrical tank with flat bottom has to have side plates of great strength to resist the bending moments. Large quantities of steel are required, and the working of the thick plates is both difficult and costly. The sharp angle between the side walls and the bottom is also a source of trouble. These troubles are avoided in the bowed or bulged tank of the "M.A.N." (Augsburg-Nuremberg Engineering Works) pattern, in which the side-walls are so curved outwards that the side plates have only to sustain or transmit tensional strains in the plane of the plate. The horizontal forces acting on the side walls are in equilibrium below through the bottom of the tank; while at the top they are resolved into tensional strains by the ring girder which runs round the holder. There is no sharp angle between the side walls and the bottom. The tank is stiffened by uniformly spaced props, which serve also to support the columns of the guide framing.

At Budapest local conditions precluded the construction of an all-steel tank. The side wall of each holder has been made as a reinforced concrete wall, 13¾ inches thick, lined with steel sheets, which take up part of the strains. The wall is stiffened by 100 reinforced concrete ribs evenly spaced on its exterior. These ribs take up and transmit the horizontal forces to the bottom or the ring girder.

The outer edge of each rib is strengthened by channel section bands, which serve both to take up tensional strains and to protect the angles of the concrete from injury. A pleasing appearance is given to the whole exterior by a simple cement or rough-cast rendering. By this method of construction there is no difficulty in making a sound joint between the side walls and the bottom of the tank.

The lifts of the holder each have an effective height of 37 feet; and their diameters, starting from the bell, are 165 feet, 167 ft. 8 in., and 170 ft. 4 in. The substance of the side sheets is 3·7 lbs. per square foot, and that of sheets of the crown of the bell is 4·9 lbs. per square foot. The sides of the lifts are strengthened by vertical stays. Special care was given to the construction of the top curb or angle-ring of the bell. The crown is supported by an arched framing of trussed rafters. The cups are constructed in the usual manner of bent sheets with flat sheets riveted to them. Tangential guide rollers are used on the top curb of the crown, and radial rollers elsewhere throughout. The axles of the rollers are of specially hardened steel; and the rollers are fitted with bronze bearing casings with ample lubrication. The columns of the guide framing are stiffened Differdinger girders, braced in the usual way by diagonal tie-rods. The framing is in four tiers, to correspond with the lifts of the holder. Steam heating is provided for the tank and cups. The contents indicator is a dial nearly 10 feet in diameter, with divided scale.

For the erection of the framing and holder, an iron trestle stage travelling on a circular railway track was provided. The bottom of the tank was riveted together on a wooden framing, and the framing for supporting the crown was erected on it and attached to an independent framing on the periphery of the tank, since the tank walls were to be in concrete. The tank bottom was then suspended from the crown framing by means of tension rods, in order that the wooden framing under it could be removed. The concrete bed beneath was covered with a 12-inch layer of tar-asphalt, and the surface of this was made smooth so that there should be no hollow spaces beneath the bottom of the tank when it had been lowered on to the asphalt. By this means rusting of the underside of the bottom was guarded against. After the bottom had been lowered, the steel lining of the side walls and the concrete walls were constructed. When the latter had set, the superstructure of the gasholder was erected by aid of the trestle stage already mentioned.

From the gasholders a portion of the gas is delivered through the distributing governor with 32-inch connections direct into the distributing system on the Buda side of the river. The greater part of the gas, however, is pumped by a turbo-compressor installation (housed in a special building) through a high-pressure main of 24 inches diameter which is carried on the railway bridge over the Danube to the gasholder on the left or Pest side of the river.

*(To be concluded.)*

## INNOVATIONS IN PIPE-LINE CONSTRUCTION.

### A Distribution Committee's Report.

Having scanned last year's reports of distribution engineers in America, the Committee on Distribution of the Iowa District Gas Association voice the conviction that there have been introduced several methods heretofore practically unknown that will become standard in their respective fields of utility. In the following recently issued report, they refer, among other things, to what they state are three distinct innovations in connection with pipe-line construction: (1) Cast-iron pipe in 16 feet lengths; (2) Matheson joint pipe; and (3) autogenous welding of steel and wrought-iron pipe.

Apart from the features of leaking joints [which can easily be overcome by up-to-date joint-making] and occasional fractures from frost or other strains, for urban low-pressure distribution cast-iron pipe does not seem to have been improved upon; the 16-feet lengths simply reducing the number of joints while adding to the weight and consequent difficulty in handling.

For joint-making, the use of lead wool has been somewhat extended in large diameter cast-iron mains; the cost of applying this joint having been considerably reduced through the use of the pneumatic hammer for caulking. The principal advantage of this joint appears to lie in its relative tightness when finished. Its advocates point out that the contraction due to the cooling of a hot poured joint, and consequent shrinkage from the wall of the bell, renders useless a large proportion of the metal intended to close the joint; and that when up-set in the usual manner at the mouth of the bell, a contact bond is insured only from the face of the joint to the edge of the joint-groove in the bell, thus reducing the shearing strength of the joint. The cost of the lead wool and cast lead joints seems to be about the same; and the cost of the cement joint is so much less (usually 50 to 75 per cent.) that it is difficult to convert the man who has had a successful experience with this joint. It is, however, conceded that the lead wool joint is most readily adapted to repair work and to making-up joints in wet places.

Matheson joint pipe is a light-weight specially prepared steel

pipe in lengths of about 20 feet, provided with a modification of the bell-and-spigot type of ends, designed for a joint of poured lead. The pipe is protected by a heavy bitumen coating under a spiral wrapping of burlap, followed by an additional coating of the bitumen preparation. The joint, after being made, is coated and wrapped; and properly installed, the pipe should prove of very long life. It does not, however, seem to possess any advantage over cast-iron pipe; and it is not any cheaper when fittings are included. While it will not fracture and may be bent, unless the utmost care is exercised the purpose of the coating will be defeated in covering the joints, and particularly at service connections made after the main is laid. It, no doubt, has merit for long cross country runs, where it will not have to be branched frequently, and no service connections are made.

For high-pressure work, autogenous welding is beyond question a great advance in the art of making tight lines. This process consists in joining together plain and steel pipe by means of a homogeneous weld produced with the oxy-acetylene torch. It has so far been applied more extensively to long transmission lines of large diameter, but lends itself admirably to the joining of pipe for most any purpose. It would seem probable that this practice will appeal to high-pressure operators in most districts, as it is obviously possible to render an installation "bottle-tight" under any condition of pressure.

There has been much discussion as to the relative merits of steel and wrought iron for main and service work. The latter material was formerly credited with many advantages not accorded the steel pipe; but in recent years improvement in steel pipe has largely dissipated former prejudices, until to-day it is claimed that the best prepared steel pipe surpasses wrought iron in strength and ductility, with the added advantage of lower cost. All steel or wrought-iron pipe for underground work should be thoroughly coated. Of the various forms of pipe-coating, probably none is as efficient and as easily handled after application as the zinc covering known as "galvanizing." Other coatings present difficulties in the handling of the pipe, such as the fouling of cutting dies, &c., but are more generally used because they can be locally applied and at less expense.

Every paint manufacturer has a paint for which he claims the properties required for an underground pipe covering, but the form of coating generally used is the following: Heat about 20 gallons of coal tar to a slow boiling-point, and add 20 lbs. of fresh-slaked lime, sifted over the top and then worked down. Boil the mixture until it becomes pasty. Let it settle for a few minutes, and add 4 lbs. of tallow and 1 lb. of powdered resin. Stir until thoroughly mixed and all ingredients are dissolved, then allow to cool. When ready for use, to each bulk of 45 gallons of the above mixture add 4 lbs. of crude rubber dissolved in turpentine to the consistency of thick cream. Then heat the mixture to about 100° Fahr., and immerse the service-pipe, heated to about a like temperature. The mixture should not be heated higher than 100° Fahr. If the preparation is too thick, it can be thinned down with kerosene when being heated for use. The pipe should preferably be dipped in a trough constructed for the purpose; but the coating may be applied with a brush.

## CALCULATING ILLUMINATION WITH INDIRECT AND SEMI-INDIRECT LIGHT SOURCES.

Writing in the "Electrical World" (New York), Vol. LXV., p. 1463, Mr. Richard C. Powell points out that calculation from the photometric curve and height of a source of light is a well-known and commonly-used method for predetermining the distribution and intensity of illumination from a direct light source. But when indirect or semi-indirect units are employed, the usual course is to rely upon judgment or a preliminary test, which often is not convenient. In the method of calculation he has developed it is necessary to know only the photometric curve, the coefficient of reflection for the secondary source (usually the ceiling), the distance of the unit below the ceiling, and the height of the ceiling above the plane of illumination.

Giving an outline of the method he proposes, he says that any light unit produces on the ceiling a secondary light source in the form of a circular disc, generally of non-uniform intensity. This disc may, however, be considered as made up of a number of circular annuli or rings of uniform intensity of illumination. The effect may also be considered the same as that which would be produced by a number of uniformly-illuminated concentric discs of varying radii. By calculating each disc separately, and adding the results, there is obtained approximately the illumination due to the ceiling. By taking a sufficiently large number of discs it is possible to make the approximation as close as desired; but, in practice, it is usually sufficient to take four.

**War Inventions Board.**—The arrangements for the organization of the War Inventions and Research Board (under the presidency of Lord Fisher of Kilverstone, G.C.B., O.M.) have now been completed. It will comprise a Central Committee and a Panel of Consultants composed of scientific experts, who will advise the main Committee on questions referred to them. Among those on the Consulting Panel are Professor Percy F. Frankland, F.R.S., Professor Bertram Hopkinson, F.R.S., and Sir Oliver Lodge, F.R.S.

## A "CIRCULAR" GAS-FIRE.

The great popularity of the gas-fire during the last few years has been largely confined to dwelling-houses, offices, and small rooms; and it has in many quarters been felt for some time that a modification was necessary to render it as popular in larger rooms, factories, and workshops as it is in the home.

In larger rooms the heat from the gas-fire has been apt to be too local; persons in front of the fire complaining of being too hot, while those near the ends of the room have not been warm enough. This defect has been particularly noticed in the jewellery trade workshops in Birmingham, where there are a large number of small factories and workshops in which the workpeople sit at the jewellers' benches arranged round the room, while there is plenty of space in the centre. The difficulty has been frequently overcome by fixing two fires back to back, with a common flue connected by a Λ-piece to the two fires. The appearance of the combination, however, leaves much to be desired.

To solve the problem of how to heat a workroom satisfactorily and hygienically, a new type of "Circular" gas-fire has been introduced by Messrs. R. J. Rogers and W. E. Cadwallader, of the Birmingham Gas Department; and the accompanying illustration shows that its appearance is both neat and artistic. Among the advantages of this fire may be mentioned that radiant heat passes from the fire to all points of the compass, instead of concentrating the heat-rays in front of the fire. The canopy comes well over the radiants; and the flue, being in the centre, allows the products of combustion to escape freely through the proper channel. In addition to the large amount of radiant heat given off from the fire, the flue-pipe provides a source of convected heat, thus utilizing a high percentage of the total heat units of the gas.

A New Type Fire for Large Areas.

The fire is very powerful for its size; the one shown having sixteen radiants, or one more than in the 21-inch ordinary pattern fire; and yet it only takes up a floor space of 18½ in. by 16 in. In addition to the workshops for which it was originally designed, it is eminently suitable for school-rooms, shops, mission halls, waiting-rooms, barracks, hospital wards, &c. The flue-pipe, which may be made of japanned iron or galvanized iron painted outside, is carried vertically from the flue-outlet to a suitable distance from the ceiling, and then turns with a gentle rise to the chimney-flue or the outer air. The first portion of the flue-pipe being vertical gives the products a fairly high velocity—thus promoting efficient ventilation. The fire is fitted with a duplex burner controlled by a single plug-cock, which is ingeniously constructed so that each part or the whole of the fire may be used as desired. To prevent the cock being accidentally turned on, it is recessed in the vertical walls of the fender. The fender is in two sections, and is designed so that there are no openings close to the floor, where dust or dirt can so easily accumulate; the primary air being admitted through slots near the top of the fender.

Particular attention has been paid by the designers to the question of maintenance. The fire-brick, burners, and all parts likely to require renewal at any time, are so fitted as to be readily taken apart and re-assembled when necessary. The gas supply connection is beneath the fender, so that it may be connected, if required, without the supply pipe being exposed. Provision has been made for firmly securing the base of the fire to the floor; and suitable concrete slabs are supplied on which the fires may, if desired, be fixed.

During the coming winter, it is probable that many of the school-rooms and other buildings that have been converted into temporary hospitals will require some auxiliary system of heating, as the hot-water or steam pipes originally installed, though suitable for ordinary occasions, will be insufficient to raise the temperature to the degree necessary for a hospital ward. In such cases as these, the "Circular" fire will be a decided acquisition, being cheerful in appearance, efficient and economical in running costs, and requiring a minimum amount of attention from those in charge. The advent of this fire appears, therefore, to be exceedingly opportune, as it provides another efficient apparatus for strengthening the hand of the gas manager in dealing with heating problems.

The fire illustrated, which is of registered design, is manufactured by the Parkinson Stove Company, Limited, of Birmingham and London.

# POWER PRODUCTION.

## The "£ s. d." of the Question.

By H. C. Widlake, M.J.Inst.E., of the Plymouth and Stonehouse Gaslight and Coke Company.

(*Continued from p.* 81.)

### Starting Gas-Engines and Electric-Motors.

The next argument we have to deal with is:

(*d*) It is a matter of labour and difficulty to start a gas-engine, whereas in the largest sized electric motor starting is an extremely simple matter.

The author has in his mind's eye a couple of illustrations which, some years ago, were used to demonstate one of the many advantages claimed for electric motors. The first illustration depicted a large gas-engine defying the united efforts of half-a-dozen grimy, perspiring, and apparently blaspheming men, to start her. The engine-room clock stands at about 20 minutes past the starting time; while a demented looking individual—presumably the works manager—is acting in a distracted manner that suggests the need for a strait waistcoat.

The second illustration shows the same engine-room occupied by an electric motor just gathering speed, the clock is right on the starting-up time; while a small boy in a sailor suit is pushing the starter up to its top notch. The gentlemen who in the previous picture were represented with profanity literally oozing out of them are depicted as a wide-eyed amazed group at the engine-room—pardon, motor-house—door; while the manager is grinning at the small boy like a monkey at the sight of a nut. The moral is obvious; but the first thing that occurred to the writer's mind on seeing it was that if the motor were in the same condition as the banished gas-engine, the small boy might push the starter up from then until Doomsday without achieving anything. A motor is certainly an extremely easy machine to start; but the starting of a gas-engine in good order does not present any difficulties up to a certain size, above which size self-starters are invariably recommended by the makers, by the aid of which the largest engine can be quickly got under way.

### Starting against Overload.

A much-worn argument in favour of the electric motor is that concerning the readiness with which it will start up against a heavy overload—a characteristic which, although admittedly possessed by some types [not all, be it noted] of electric motors, is at the same time one that has caused, and always will cause, that machine to be sadly abused by the average user. This characteristic has technically much in common with the question of running overloaded; and the arguments advanced in condemnation of the practice apply largely to the present case. Public supply authorities, as a rule, look with a considerable degree of disfavour upon motors which are run up against load, particularly where the lighting supply is taken off the same mains as those to which the motor is connected, and protect themselves by the insertion of safety fuses in boxes which, as a rule, are sealed and accessible only to the supply undertaking's own officials.

Even assuming that the motor, and more particularly its starting gear, is designed for starting against full load, it must not be forgotten that there is always a risk of blowing the supply authorities' fuses, and so being involved in a total failure of supply until such time as an authorized official can be obtained in order to renew the fuses. The practice of starting under full-load is in many cases a pernicious, as well as an utterly unnecessary one, against the evil effects of which the electric motor, unlike the gas-engine, cannot protect itself.

### Cleanliness and Attention.

(*e*) The gas-engine is not a clean type of prime mover.

(*f*) A gas-engine requires constant attention; whereas attendance charges in connection with an electric motor are practically *nil*.

The electric motor certainly lends itself to the maintenance of cleanliness in its surroundings; but, advanced as a serious argument in its favour, this appeals only to a naturally slovenly machinery attendant at whose tender mercies an electric motor stands a far greater chance of breaking down than does a gas-engine. The average factory motor, whether gas or electric, is not always kept in a scrupulously clean condition; and the extent to which the presence of dirt conduces to electrical breakdowns is too well known to need enlargement.

As regards attendance, an electric motor, like a modern gas-engine, will admittedly run for long periods without attention; but a power user who employs either machine under this impression is certainly looking for trouble, and sooner or later will as certainly find it.

In regard to oiling, the modern gas-engine is automatically lubricated, and will run for many hours with one filling of the lubricators.

The attendance charge may be exactly what the plant owner is wise, or foolish, enough to make it. An example of the extent to which such folly may be carried was provided to the author about twelve months ago, when, on the occasion of a visit to a moving picture theatre, he was referred to the "engineer"—a gentleman who has forsaken the prosaic task of bill posting for the more technical occupation of sitting on a chair watching a motor generator spin around, for which he received 30s. a week.

As a general rule it may be observed that any prime mover should be given a few minutes' inspection every couple of hours. This precaution, in either case, is not necessary—it is simply wise.

### Reliability Comparisons.

(*g*) A gas-engine is less reliable than an electric motor, and renewals are frequent and costly.

It is a well-known fact that the experience of insurance companies has been, and still is, that electrical machinery is responsible for the highest proportion of breakdowns. According to the British Engine, Boiler, and Electrical Insurance Company, one in every eight of the selected motors insured by them have broken down; while, taking electrical machinery as a whole, the proportion is one breakdown to every three electrical installations. In a paper read before the Manchester Association of Engineers, in January, 1914, by Mr. Edward G. Hiller, the Chief Engineer to the National Boiler and General Insurance Company,* the reliability of small gas-engines is demonstrated in a very remarkable manner, and by Mr. Hiller's permission the author is privileged to include the following interesting particulars in this article.

Table VI.—*Reliability of Different Types, as indicated by:*
*N, Number of Breakdowns;*
*R, Number of Breakdowns × Cost of Repairs per Breakdown.*

| — | N. Number of Breakdowns. Steam-Engines Taken as 1. | R. Number of Breakdowns × Cost per Breakdown. Steam-Engines Taken as 1. |
|---|---|---|
| I. Steam-engines . . . . | 1·00 | 1·00 |
| II. Steam-turbines . . . . | 3·36 | 6·30 |
| III. Gas-engines up to 14-inch | 0·60 | 0·24 |
| IV. Gas-engines, 15 to 24 inch | 2·82 | 3·01 |
| V. Diesel engines . . . . | 3·00 | 3·75 |

The following is a quotation from Mr. Hiller's paper:—

"These reliability statistics are derived from the experience of the National Boiler and General Insurance Company, Limited. They represent experience on this particular characteristic up to date. They, of course, are not permanent figures; the reliability of different types may be altered or improved by changes in the character of the maintenance, by increased care in driving, by improved construction, material, or design. Any type, therefore, may progress from a low degree of reliability to a high degree, as, indeed, has been the experience in the past.

"Column N (Table VI.) represents the relative number of breakdowns of engines of that particular class per annum; the figures of steam-engines being taken as 1.

"It is to be recognized, however, that the importance of breakdowns or stoppages is to be measured not only by the number, but also by the cost of making good. Column R has been added to represent the relative figures in this respect; steam-engines being reckoned as 1. A broad survey of these figures indicates that steam-engines, in respect of reliability, stand at the head of prime movers for comparatively large powers. The small gas-engines up to 14-inch diameter show even better results than steam-engines of all sizes, but the larger gas-engines, on the other hand, by their higher figures of the number of breakdowns and cost, show a substantially lower degree of reliability."

Unfortunately, no mention is made in this table of the claim of the electric motor as regards reliability; but the returns of the insurance companies certainly prove that the percentage of breakdowns among insured electric motors is higher than that among insured gas-engines. This may be due to the fact that electric machinery is usually underrated so far as capacity for continuous working is concerned; while it is liable to be stopped by the legitimate action of the very devices which are inserted for its protection, or, in the case of a public supply, by some accident outside the factory.

The question of reliability is closely associated with insurance rates; and the following table gives the respective rates charged by one of the leading insurance companies for gas-engines and motors. The rates for electric motors are decided by the horse power, and not (except in very special cases) by the type of machine; while among the factors that decide the gas-engine rates are the number of cylinders, the diameter of the same, and the piston speed.

The rates in Table VII. are approximate, and are based on the assumption that the engines have one cylinder and are worked on town gas.

Table VII.—*Insurance Rates for Gas-Engines.*

| Approximate Brake Horse Power. | Approximate Diameter of Cylinder and Length of Stroke. | Amount Insured. | Approximate Annual Premium. |
|---|---|---|---|
| | In. In. | £ | £ s. d. |
| 7 | 5 by 10 | 50 | 1 2 6 |
| 11 | 6 by 12 | 50 | 1 5 0 |
| 21 | 8 by 17 | 50 | 1 17 0 |
| 51 | 12 by 22 | 100 | 4 1 0 |
| 80 | 15 by 20 | 200 | 6 7 0 |
| 115 | 17 by 24 | 200 | 8 10 0 |

* See "Journal" for Feb. 3, 1914, p. 294.

TABLE VIII.—*Insurance Rates for Electric Motors.*

| Approximate Brake Horse Power. | Amount Insured. | Approximate Annual Premium. |
|---|---|---|
| | £ | £ s. d. |
| 7 | 25 | 1 13 0 |
| 11 | 30 | 2 1 0 |
| 21 | 50 | 2 15 0 |
| 51 | 75 | 4 2 6 |
| 80 | 125 | 5 4 0 |
| 115 | 175 | 6 10 0 |

The statement that renewals to gas-engines are frequent and costly is not borne out in practice; and it may safely be said that an engine upon which a reasonable degree of attention and care has been expended will run its entire life—say, 20 or 30 years—without involving its owner in any heavy maintenance charge. It is quite sufficient to thoroughly clean the engine every three or four months, and to make the necessary small adjustments to the valve-gearing which will tend to keep the engine in an efficient condition.

### Age Depreciation.

It has been stated by electrical enthusiasts that depreciation with age is more rapid in a gas-engine than it is in an electric motor; but this is a fallacy which must be obvious to any who have had any experience of both types of prime movers. In a gas-engine diminished efficiency due to age is usually a matter which can be rectified in a very short time, and at a trifling cost; while in a motor its cause is not so apparent, and its remedy a matter of delay and heavy expense.

An internal combustion engine usually gives ample warning (often weeks beforehand) of anything going wrong, and thus permits of the "stitch in time" being applied before an actual breakdown takes place. The occurrence of a fault on an electric motor, however, usually means an immediate shut-down, and occurs without any previous warning, involving a startling transition from satisfactory working to a dead-stop, with all the attendant inconvenience—dislocation of business and diminution of output.

### Space Occupied.

(*h*) A gas-engine takes up a relatively larger amount of space than does an electric motor of equal power.

The space taken up by most forms of power motors is inversely proportional to the speed at which they are designed to deliver their rated output. Let us take as an example the engine of a certain well-known 15 cwt. commercial motor vehicle. With a bore of 80 mm. and a 110 mm. stroke, this engine is designed to develop 15·9 H.P. at 1200 revolutions per minute, and occupies an area of certainly not more than 4 square feet—weighing something in the neighbourhood of 20 to 30 lbs. per B.H.P.

An ordinary industrial stationary engine, on the other hand, rated to give this output at a speed of (say) 250 R.P.M. would occupy a floor space of about 30 square feet, and weigh about 2 tons, or (say) 140 lbs. per B.H.P. The same relationship between power, speed, and space occupied exists with regard to the electric motor; while in this instance the price of the machine is inversely proportional to the speed. The following list, taken from the publications of a well-known firm of motor manufacturers, gives interesting data regarding six 25 B.H.P. motors of different speeds, together with their efficiencies, space occupied by motor and slide rails, and their weights.

TABLE IX.—*Particulars of* 25 B.H.P. *Electric Motors.*

| Speed. | Approximate Price. | Efficiency. | Net Weight. | Area Occupied. |
|---|---|---|---|---|
| R.P.M. | £ | Per Cent. | Lbs. | Square Feet. |
| 1150 | 62 | 90 | 1484 | 11 |
| 760 | 75 | 88·5 | 1850 | 14 |
| 520 | 87 | 88 | 2800 | 17 |
| 270 | 127 | 87 | 4216 | 23 |
| 230 | 153 | 85·5 | 5866 | 24 |
| 190 | 165 | 85 | 6970 | 26 |

From these particulars, it will be obvious that the average electric motor is a high-speed machine, and that the cost of its manufacture increases largely with diminution of speed, as does also the weight and the floor space occupied by the machine.

### Question of Shafting.

For the usual commercial purposes a high-speed, and hence a comparative low-priced, motor is offered; but it must be remembered that the expenditure does not always end with the motor and its switchgear. Means have to be provided to reduce the high motor speed to the figure at which the line shafting has to be run; and, in addition to the expense involved by the provision of a countershaft and belting, it must not be forgotten that this gear involves a continuous transmission loss, and hence increased running costs.

It has been argued that a motor can be run direct on the line shaft; but in the case of a high-speed machine this requires the use of an abnormally large pulley on the shaft. The head room available does not always permit of this; and a compromise often arrived at is the use of as large a driven pulley as possible on the line shaft and a small pulley on the high-speed armature shaft. This practice, to the writer's mind, constitutes the limit of imbecility, and can only conduce to a high percentage of slip, heavy consequent power losses, the ruination of belts, and a generally inefficient state of affairs, compared to which the losses in an additional countershaft fitted with reasonably designed pulleys would have been much preferable. On the plant under the writer's charge small diameter pulleys on high-speed shafts are strictly tabooed; and main belt drives from electric motors running at 3000 to 4000 feet per minute are not uncommon, and give the greatest satisfaction; while the belts considerably exceed the period usually allowed for depreciation of belting.

### Gas-Engine Cooling Tank.

Astute electrical enthusiasts, waking-up to the fact that cooling tanks as used on gas-engine installations occupy space, pounce upon the fact with avidity, and wear it threadbare in their efforts to dress it up in the light of a serious reason why a gas-engine should be banished. Incidentally these tanks can be made to perform a very useful purpose, and will provide a constant supply of warm or hot water for commercial purposes, or for the feed to small boilers. In a case recently under the writer's notice, the feed for a 40 H.P. Babcock and Wilcox boiler was drawn from the tanks of a 15 B.H.P. gas-engine. This supply was at an average temperature of 120° Fahr., and resulted in a saving of 20 cwt. of coke per week, as compared with the time when a cold feed was used. The generation of heat is inseparable from the employment of internal combustion engines, and may be looked upon as a valuable residual if intelligently utilized and controlled.

### Bonecourt Waste-Heat System.

The advent of the Bonecourt waste-heat boiler has placed within the reach of the small power user a ready means by which he can utilize the heat units contained in the exhaust gases from his gas-engine, and so obtain a regular supply of hot or boiling water over and above that with which his circulating water-tanks will provide him. As a general rule, the heat contained in the exhaust gases of internal combustion engines is entirely wasted, and may easily amount to as much as 30 to 40 per cent. of the total heat supplied to the engine. Its amount will depend upon the make of the engine, its condition, the method by which it is governed, and the load factor under which it works. If the waste gases are exhausted direct to the atmosphere or through a silencer, the whole of this heat is wasted, and, being a continuous loss, it is bound to be a serious one.

In the Bonecourt system, the exhaust gases are led through a boiler of special construction, in which a large percentage of the heat is utilized in the raising of the temperature of the water or the generation of steam. It has been found practicable to deliver about 2 gallons of boiling water per B.H.P. per hour from a feed temperature of 60° Fahr. Putting this into brief figurative statement, it means that from the exhaust of a 60 B.H.P. gas-engine working at full load, over half a ton of boiling water would be obtainable. The author would suggest that if the feed for such a boiler were taken from the engine circulating tanks, instead of from the main, this already excellent figure would be greatly improved upon.

Even if a user of an internal combustion engine cannot obtain all the steam or hot water he may want from this source, he may just as well get all he can from the heat that otherwise is being wasted. The proposition thus becomes of very great importance to gas companies, since anything that tends to increase the usefulness and efficiency of the gas-engine will tend to increase the sale of gas for power purposes. This boiler acts as a very effective silencer, while it does not throw any undue back-pressure on the engine.

### Age and Efficiency.

(*i*) The efficiency of a gas-engine decreases largely with age, while it is wasteful at light loads.

This statement, like many others of a similar nature detrimental to the gas-engine, does not find corroboration in actual practice. There are hundreds of 20-year old and upwards engines operating at practically the same efficiency as they attained when first installed. Any diminution of efficiency in a gas-engine is invariably due to some slight adjustment being necessary; and in most cases the outlay required to restore an engine to a state of efficiency is trifling.

Omitting capital and depreciation charges, and dealing with running costs only, it will be observed, on reference to Table I., taking the case of a 30 B.H.P. gas-engine the hourly full load consumption will amount to 609 cubic feet, which, at the rate on which the table is based, would cost 9·7d. Turning to Table II., we find that a 30-B.H.P. electric motor, running under exactly similar conditions, will consume 25·7 B.T.U. per hour, and cost 38·5d. In other words, on the basis of running costs alone, electrical energy would have to be retailed at under 0·4d. per unit before it could compete on economical grounds with town gas at 1s. 4d. per 1000 cubic feet.

Putting this argument in still another form, the 30 B.H.P. gas-engine, in its decrepit old age, would have to deteriorate into such a scandalous state of disrepair as to consume $\frac{20{\cdot}3 \times 38{\cdot}5}{9{\cdot}7} = 80{\cdot}5$ cubic feet of gas per B.H.P. per hour before the claim of the electrical enthusiast in this respect could be commercially justified. Having regard to the consistent manner in which gas-engines invariably operate, the author is aware this argument is now carried to an absurdity; but such a method is sometimes necessary to entirely squash an argument which is, in itself, absurd.

As regards the light load efficiency of gas-engines it is certainly

true that a gas-engine is least efficient at light loads, and, incidentally, the same statement is perfectly true of the electric motor.

The frictional losses in a gas-engine are much the same at all loads; and except at the lightest load, the gas consumed per I.H.P. will remain practically the same.

RELATIVE OVERLOAD CAPACITIES.

(*j*) The overload capacity of an electric motor is very high, while that of a gas-engine is limited.

No argument in favour of the electric motor has been worn so utterly threadbare as this particular one, and, incidentally, nothing has led to the abuse of the machine in whose favour it is advanced more than has this particular characteristic. Its consideration immediately brings us to the whole vexed question of lighting. An electric motor or a gas-engine, or any type of prime mover, is either suitable for the load under which it has to operate, or it is not; and the more clearly this is recognized, the more strikingly apparent will become the folly of ever allowing this argument to become a serious factor in power competition. Electric motors are always rated on a thermal basis—namely, upon the length of time over which they will carry a given load with a given rise of temperature. This rating ensures that the motor will not be subjected to a temperature which can be detrimental to the insulation of its windings. A motor that is so rated will be found quite capable of operating under a load considerably in excess of its capacity expressed upon this basis, but it is a sure thing that frequent or prolonged abuse of this description will inveitably result in the total destruction of the windings, the insulation of which in such circumstances must tend to become brittle, and to lose its dia-electric properties.

In the case of the gas-engine, its fly-wheel may be regarded as a reservoir of power which is available in the event of a sudden demand for a short period; and such a machine rated to take (say) the normal load of a small factory, will be enabled to deal with the constantly recurring peaks, because of the energy stored up in the heavy rim of the revolving fly-wheel, which starts to expend itself immediately upon a slight reduction of speed caused by a big demand.

An electric motor, on the other hand, has to be rated upon approximately the maximum demand provided it is desired to run it within the limits of safety. In short, a good make of either form of prime mover is rated upon a basis which its manufacturers consider a safe one; and if this rating is exceeded, the effect is bound to be a detrimental one.

To a certain extent a gas-engine protects itself against this form of abuse by slowing-up under a heavy overload; but an electric motor does not do so to anything like the same extent, and may under such conditions continue to run along to its final destruction.

The capacity of a good gas-engine to take an overload and exercise a large starting torque was dealt with at length in a short article by the writer on an unusual transmission difficulty at a local laundry* which was solved in an eminently satisfactory manner by the Company with which he is associated; and at the risk of being accused of repetition, he feels that this argument cannot be dealt with in a proper manner without a reiteration of the explanation that was made in that article as to the factors which determine the overload capacity of any prime mover.

* See "JOURNAL" for June 22, p. 695.

(*To be concluded.*)

## MIXING OF THE GASES IN THE BUNSEN FLAME.

At a Meeting of the German Physical Society last year, Professor Haber reported observations he had made on the bunsen flame, which the "Zeitschrift für Beleuchtungswesen" thinks may have practical bearing on the construction of burners.

It is well known that a bunsen flame, fed with coal gas, begins to smoke first at the tip, and not at the side, when the supply of air is reduced. Professor Haber observed the same phenomenon when the burner was fed with benzene-air-gas; and he found by analyses that there was a richer gas near the tip of the flame than at the sides. But when the burner was fed with a mixture of hydrogen and air, the flame first began to smoke at the sides, instead of the tip; and it was found there was more hydrogen on the outside than in the core of the cone. Benzene is heavier and hydrogen lighter than air; and it appears that a separation of the constituents of the uniform gaseous mixture occurs in the cone—the heavier remaining in the core and the lighter going to the envelope. No such separation occurred when the gas issued from the burner unlighted.

Professor Haber considers that the changes of pressure and density produced by the flame bend or twist the lines of the gas current before it enters the inner cone, and thus cause accelerations or velocities, such as occur in a centrifugal machine, on a sufficient scale to effect differences (detectable by analysis) in the composition of the gaseous mixture at the tip and the sides of the cone. Professor Warburg has suggested that the separation observed might have been due to fall of temperature, since different parts of the flame are at different temperatures. Professor Haber, however, considers that such a fall cannot be great, because the gas loses by convection the temperature it acquires by conduction. He intended, however, to pursue the study of the question.

## RESEARCH IN TECHNOLOGY.

**Mr. Charles Carpenter, D.Sc., on the Need for a Royal College of Technology.**

Mr. Charles Carpenter, D.Sc., the Chairman of the South Metropolitan Gas Company, and President-Elect of the Society of Chemical Industry, delivered a paper entitled "Research in Technology" at the annual conference of the Society of Chemical Industry at the Manchester School of Technology last Thursday.

In introducing the subject, Mr. Carpenter said it was significant that the theme chosen by the Council for discussion was given prominence to in the inaugural address delivered by the first President of the Society of Chemical Industry in the City of Manchester thirty-three years ago. When pleading the case for research as applied to the chemical industry, Sir Henry Roscoe expressed the belief that while the British manufacturer was often late in adapting his methods to the ever-changing circumstances of the time, he was not often too late. There must, he proceeded, be many present whose considered opinion a year ago would have been that such hopes had been in the main unrealized, and were even farther than ever from achievement. Disregarding the royal exhortation to "Wake up," the Nation continued to surrender the care of its existence to political quacks whose skill lay mainly in mesmerizing its reason and blinding its intelligence. A rousing, with terrible force, had come at last, and it turned from false gods to Science, realizing that civilization unarmed by her was helpless. But it was useless to expect to find in distress an armoury unprovided in times of peace. By diligent, unremitting, and long-continued work alone could such provision be made; and this was no less true of chemical than of all other industries which went to build up the power that was designated as Applied Science.

Such was research, whether chemical or industrial. Both needed undertaking equally, not only to provide present and certain requirements, but future and possible ones. The chemical industry of to-day could not make progress without research of both kinds. This was why the meeting was not concerning itself with particular processes or manufactures, but with the broad foundations which were an absolute essential of its stability. That research (Mr. Carpenter continued) must commence with the chemist went without saying. Circumstances had, however, changed since the inception of the first great chemical processes. The technical demands made by modern manufacturers were much more extensive and exacting, and sole reliance upon the chemist would be fatal to the realization of success. Sooner or later the aid of the technologist must be called in. His equipment for the task had now to be discussed, and it was easily seen that it was on a very different footing to that of his confrère, for it must be carried out on a large or working scale. Surely here was an overwhelming case for localized centralization, if one fact, and one fact only, was borne in mind. It was not from or among themselves that the greatest competition was to be feared, but from producers over the seas already organized. Let, then, every special industry build up its own schools or institutes of technology, not only to provide training for workers, but so fully equipped with resources that problems of all kinds could be submitted to them for research. It might be said that one manufacturer would be contributing to progress made by another. This might be true; but it would be better for him to put a small tax upon his profits for such a purpose than, by want of united effort, risk losing his trade altogether. It might be argued that the risk would be a great one in reposing so much confidence with the principals of such organizations. But if they distrusted their physicians, they would run the risk of being decimated by disease. Was there one in a thousand who distrusted his adviser in sickness? Why should the physicians of industry be disloyal or less honourable? Such institutions as suggested would be clearing-houses for troubles to which manufacturers would automatically turn whether perfecting an old process or working out a new.

THE COMING INDUSTRIAL BATTLE: HOW TO MEET IT.

If as a nation they were to emerge successfully from the industrial battle which was awaiting them, they must pool not only their difficulties but their solution. When it was required to start new processes or adaptations, it would never do for each manufacturer to proceed as was now the case—viz., start *de novo* and work out for himself methods of its industrial application which were already known and used in other directions. He would get it from the institutes. If—as in some cases—the information as to certain methods of plant was confidential, he would be put into communication with the users, and matters might then be left to develop on ordinary business lines.

Stated another way, the proposal was for manufacturers to be able to draw upon sources of technological knowledge just in the same manner as did the chemist from a scientific library—without such aid the foreign competition of the future would never be mastered by them. Such centres of research as advocated already existed. It was not necessary to go outside the City of Manchester for a splendid example of what could be provided by a far-seeing Council. Whether their provision was supported and their resources drawn upon by manufacturers in the manner suggested could not be stated. But even when every industry throughout the land had its centre or centres of technological research, the structure upon which the Nation's chemical industries was

to be securely established was still incomplete, the arch was without its keystone, the bonding absent of each component. Their directors had been likened to the physicians of technology. Why should not technology, like medicine and surgery, have its college of control, inspiration, and direction? State-aided, and therefore independent, keeping in touch with all technical progress and requirements through the media of the many associated institutes throughout the land, a Royal College of Technology would raise and promote chemical industry to the dignity it deserved as a branch of Science, and encourage the utilization of the knowledge which was fundamental to the maintenance of our position among the Nations of the world.

## RESEARCH AND CHEMICAL INDUSTRY.

Dr. M. O. Forster, F.R.S., of London (a member of the Technical Committee established by the Research Department of British Dyes, Limited, under the chairmanship of Dr. G. T. Morgan, F.R.S., of the Royal College of Science for Ireland (Dublin), which Committee also includes Dr. J. C. Cain, Editor of the "Journal of the Chemical Industry," and Mr. J. T. Turner, Technical Director of Messrs. Read Holliday and Sons, of Huddersfield), contributed a paper entitled "Research and Chemical Industry," a summary of which, together with the suggested scope of a Chemical Intelligence Department to be instituted by the Government as a Branch of the Board of Trade, is given.

Dr. Forster said the first necessity for a closer union between research and industry was the development of a healthy public opinion on the subject of acquiring knowledge in general, scientific knowledge in particular, and, more important than either because it covered both—national wisdom. In order to do this, speaking bluntly, our Governments must advertise scientific methods of business and education by the employment of such methods in their own operations. This was no more undignified than raising an army by advertisement; and, after all, what was advertisement but the act of making known—in a word, education itself? In the establishment of such opinion an important place should be given to the work which chemists did—the part which chemistry had played in the national economy, and the possibilities offered by a wider application of chemistry to industry—in order to attract to our ranks the type of young man able to use chemical training as a weapon for making chemistry pay. Next, though many enlightened manufacturers already made good use of chemistry, their numbers must be increased, and the new comers must not be too quickly discouraged by what might seem initially an unprofitable investment. One of the ironies of their present position was that a yearly outlay on chemists and a laboratory, moderate even if regarded as a frill or luxury, would often make relatively small inroads into the profits of a concern; while regarded as an investment, would be positively gilt-edged compared with many of the enterprises for which the public were invited, frivolously and successfully, to subscribe millions.

Promoters had had enormous profits from hundreds of shaky home flotations; and all this with little or no inquiry or investigation or foresight on the part of capitalists, traders, or other investors. On the other hand, it had been recently claimed by Mr. W. J. Dibdin, for many years Chief of the Chemical and Gas Department of the Metropolitan Board of Works and the London County Council, that "the operations of the Chemical Department of the London County Council and the Metropolitan Board of Works effected a saving in one particular item of £10,000,000 capital expenditure to the ratepayers of London," and, he added, "the ratepayers of London have acknowledged the work done by its chemical technologists by abolishing the department." Such misdirection of effort could only lead to disaster. It was not to be expected that when the war was over there would be any mitigation of "Gott strafe British Dyes, Limited," and any other industry which ventured to raise its head; and the situation must be faced with resolute courage and all the resources of our people, both material and intellectual. He ventured to lay before the Society, as a basis of discussion, the draft of a scheme for a Chemical Intelligence Department which, in his opinion, should be established by Government as a branch of the Board of Trade. Having placed this in the hands of Mr. Runciman and Mr. Pease on May 6, he had secured the permission of these gentlemen to use it on the present occasion; making it clear, however, that it represented his own personal views, and not the considered opinion of the deputation as a whole. In doing so, he ought to mention that he had not then read the article by Sir William Ramsay which appeared in "Nature" for May 20, and which covered a portion of the same ground. Furthermore, it was not contemplated that clauses A (2) and A (3) would conflict with the operations of chemists in consulting practice. On the contrary, under A (5) these clauses should assist in rendering those operations more widely appreciated—recognizing, as he gladly did, that the work of such chemists was frequently more entitled to be called "research" than much that is published in the journals of unapplied science.

Suggested Scope of a Chemical Intelligence Department to be Instituted by H.M. Government as a Branch of the Board of Trade.

A.—Technical.

(1) Classification of chemical discoveries at home and abroad as evidenced by (*a*) patent specifications, (*b*) scientific memoirs.
(2) Distribution of chemical information to scientific inquirers and to manufacturers seeking new developments or desiring to improve existing processes.
(3) Collection of information regarding the most suitable materials for constructing chemical plant and apparatus on a manufacturing scale, and the most convenient sources for supply of such plant and apparatus.
(4) Tabulation of the bye-products arising in various chemical industries, and consideration of the most profitable ways of utilizing these.
(5) Presentation of problems arising out of (3) and (4) to the numerous research chemists throughout the country, such problems to be offered under proper discretionary safeguards and with appropriate remuneration.

B.—Techno-Commercial (by co-operation with the Board of Trade).

(1) Classification of foreign chemical products in respect of their distribution throughout the world, with ruling prices, tariffs, cost of transport, and, where possible, cost of production.
(2) Classification of the resources of the Empire and friendly nations in raw materials, for the purpose of finding novel applications of these.

C.—Techno-Educational (by co-operation with Board of Education).

(1) Classification of data regarding opportunities for chemical instruction and research in various parts of the Empire, and comparison of these with those offered in foreign countries.
(2) Consideration of possible improvements and extensions in existing Imperial methods suggested by the information thus gained.
(3) Consideration and, where possible, application of methods by which wage-earners of good conduct and adaptability might be trained as technical foremen.

## DEVELOPMENT AND CONTROL BY PUBLIC INFLUENCES.

Professor H. E. Armstrong (Warrington), in the course of a lengthy paper entitled "Development and Control by Public Influences," expressed the view that scientists were, seemingly, too hopelessly individualistic to organize themselves. The Royal Society, which was the supreme authority in science, declined the task early in the year; and it was not likely that politicians would seek to bring them together, as they had no understanding of the use to which they might be put in their service. As a body they needed to "wake up" and intervene actively in the promotion and protection of chemical industry.

Touching upon the importance of research work, he suggested, considering the small amount which was being spent in research work in the coal and iron trade, that a small tax should be levied, which should be applied to the full scientific study, under competent control, of every particular connected with the industry.

He would extend this proposal to all industries in which the maintenance of research departments was necessary. One part of the tax should be applied to the upkeep of proper works' laboratories, and another part to the development of research work in places of higher instruction. In cases in which the industry was alive to its own interests and maintained a proper scientific establishment, due allowance would be made, and the contribution exacted would only be that required for public purposes in support of technical education. The necessary interlocking of industry and education would at once follow from such a course of action; Government intervention would be reduced to a minimum; and all sensible manufacturers who desired not to go-under would make due provision for the scientific control of their industry.

After referring to the importance of further research into the dyestuffs question, Professor Armstrong said it would be needful for them, as a body, sooner or later to move in the matter of the Patent Laws, to consider to what extent, in future, a specification shall be a disclosure and description of the invention for which protection was sought. Their plain duty in the Society of Chemical Industry was to organize themselves, and when they were organized to claim the right to guide the Government. But, unless the representatives of science subordinated their individualism—sunk their differences and formed a complete coalition of forces—no public impression would be made.

It rested with the Royal Society to give the impulse and to start reform, by reforming itself—waking up from its academic slumbers, and playing the active part that it was possible for it to play if it only realized what it could do as a live institution. It was their scientific House of Peers. It was not only representative of all branches of experimental and observational science, but industrial science had its place in our ranks, although it was to be confessed that they were ultra-academic at present, and needed a far larger leaven of men accustomed to apply science to practice.

Owing to the development of the special societies, the Royal Society was no longer of consequence as a scientific society in the ordinary sense. Unless the forces at its disposal were used effectively, it would cease to be of service, and there would be little satisfaction in belonging to it. The Society must be organized as a democracy. At present, it was little short of entirely in the hands of a ring of all but permanent, autocratic officials, and the Fellows had but little part in its proceedings, as the Council in no way represented the desires and ideas of the Fellows.

## CHEMICAL ENGINEERING.

Mr. G. T. Beilby, D.Sc., F.R.S., in the course of a paper on "Chemical Engineering," touched on several points of interest, treating the subject as a central feature in works' organization rather than as a question by itself. He said that in modern organization there was room for the research chemist of high and wide attain-

ments, for the scientifically trained engineer (also of wide attainments), and for a type of professionally trained man who was the natural medium of interchange between these two specialists. This intermediary was the chemical engineer. He must be a man of special aptitudes, inasmuch as he must have grasped the chemists' point of view as well as the engineers'. The chemist thought and worked in terms of atoms and molecules and the laws which governed their combination. The engineer thought of matter in masses which could be moulded to his will by the craftsman, or of mechanical or electrical energy which could be generated, controlled, and measured by machinery. The chemist was the master and director of his own operations, which he could for the most part carry out with his own hands. The engineer lost his direct hold on his operations whenever his ideas had been fully committed to paper in the drawing office. It was his special function to organize the labours of many workers.

A certain number of men were able to enter fully into the spirit which actuated both types of expert—the chemist and the engineer. They could resist the particular exclusiveness of each, while giving to each its due weight. These were the naturally gifted chemical engineers who in one sense were "born not made." In our colleges and universities the best that they could do for men of this gifted type was to give them the best possible opportunities for an all-round development of their powers. For the average men, they ought to provide a properly organized course of training in theoretical and practical chemistry, physics, and mechanics, on professional, not on purely academic lines. Our colleges had thus two distinct functions to perform, and it was best that this should be clearly recognized, first to allow the future leaders in Applied Science to come naturally to the top during their training, and, secondly, to prepare a large number of well-trained professional men for the organization and development of industry. The ideal for these men must be a professional one. The ideal that "every man in the ranks ought to realize that he carries a Marshal's baton in his knapsack" was as false as it was unpractical. It would never help the drill sergeant to produce useful soldiers, nor the commissioned officer to acquire sound knowledge of his profession. It was to be feared that the making of practical chemists had suffered severely from a similar fallacy—namely, that all students ought to aim at being pioneers in some branch of their science. Science and industry alike called aloud for real pioneers, for without them the highest type of progress could not be realized. This call, however, could not be met by the premature stimulation of "originality" in men of very ordinary endowment. The effect of this stimulation was not merely futile, it was positively mischievous; for it raised an ideal which for the ordinary man was quite inappropriate during his preparation for a life of serious practical endeavour. The phenomenal development of chemical industry in Germany had resulted much more from the large command of chemists and engineers of sound professional training and ability than from the possession also of an even larger supply of research chemists of mediocre ability.

## DISCUSSION.

Professor HENDERSON, who presided, said, with regard to the establishment of a Commercial Information Bureau, that the Council had given serious consideration to the question during the year. They could quite understand, however, that such a scheme could not be carried out without considerable expenditure. Failing its establishment under the *ægis* of the Government, he hoped the Society themselves might take up the question, for there could be no two minds as to its immense desirability from the commercial and the National points of view. As the Society of Chemical Industry existed largely for the benefit of manufacturers, it seemed to him that it was up to the Society whether they should not undertake the institution of such an intelligence department as had been suggested.

Mr. H. M. RIDGE contrasted German technical procedure with our own. In that country, the manufacturers of a particular commodity—spelter, for instance—met together and discussed spelter in one close, united body. They discussed nothing else but spelter; extraneous matters were not introduced. Another thing was that no shorthand notes were taken of technical meetings in Germany. He suggested that, perhaps, something of the sort might be advisable in this country.

Mr. F. H. CARR (Nottingham) heartily congratulated Mr. Carpenter on his excellent contribution. He cordially agreed with him that manufacturers should be able to draw upon sources of technological knowledge just in the same manner as did the chemist from the scientific library. With regard to the establishment of an Intelligence Bureau, it seemed to him to be predestined to failure unless the Society had some very large guaranteed funds behind them. Such a bureau should be supported by the Government; and he hoped that, if and when it was formed, the Society of Chemical Industry would see that they were properly represented upon the management. Another thing badly needed in every large centre—where not already existing—was a complete technological and technical library, in order that books could be readily consulted by members.

Mr. R. H. CLAYTON (Messrs. Hardman and Holden, Limited, of Manchester) agreed with the last speaker in regard to the establishment of technological libraries in important industrial centres of England—say, Manchester for the Lancashire district, Leeds for the Yorkshire district, Birmingham for the Midland district, and so on. Such technical libraries should be founded and maintained out of the funds of the Council, so that students who had been trained at various technical schools would be enabled to have access to literature that would be useful for their further investigations.

Mr. T. TYRER (London) complimented Mr. Carpenter and the other authors of papers on the excellence of the technical fare provided. He thought that other scientific societies—seeing that what they were proposing to do would benefit all—should be approached with a view to bringing before the authorities the need for the establishment of an Intelligence Bureau such as had been advocated.

Professor H. E. ARMSTRONG (Warrington) reminded the meeting that Mr. Carpenter had distinctly stated in his address that "such centres of research as advocated already exist." Further, he also said: "It is not necessary to go outside the City of Manchester for a splendid example of what could be provided by a far-seeing City Council." He (Professor Armstrong) congratulated Dr. Forster on his appointment as a member of the Technical Committee established under Dr. Morgan, and hoped that he would bring his great influence to bear in the establishment of a Chemical Intelligence Department of the Board of Trade on the lines he had himself suggested. Until they got men like Dr. Forster in the House of Commons [Dr. Forster is prospective Conservative candidate for Blackburn], they could not hope to get along as fast as they desired. As to technical education in Manchester, he asked whether there was sufficient co-ordination between the two departments of instruction. Were the Manchester City Council working in full harmony with the University? Was there not too much elementary work being done in the Manchester Institute of Technology, and far too little of the higher branches of study? It was a question of primary importance to the city whether, in relation to other scientific branches of the University, the Institute of Technology was really of the importance to Manchester that it should be. Mr. Carpenter had certainly drawn attention to a most important aspect of technological work in asking whether the institution was supported as it should be, and its resources drawn upon by manufacturers.

### CENTRAL TECHNICAL LIBRARIES.

Mr. J. MAXWELL GARNETT, M.A. (Principal of the Manchester School of Technology), said that the Manchester City Council was the only education authority in the country that was financially responsible for the management of a University institution. All the different faculties worked harmoniously together, and there was little or no overlapping. The reason why more young men did not remain at the school in order to be trained in research work was because the demand for their services was greater than the supply. At least three appointments were offered to every two men who graduated; and this had been the case for the last three or four years. It was true that a certain amount of elementary work was still being done in the School of Technology; but this was to some extent unavoidable, as when the first beginnings were made a hundred years ago towards the establishment of a School of Technology it was intended that the school should be used for the purpose of enabling students and artizans (who were for the most part occupied in ordinary work during the daytime) to continue their studies in the evenings. It was very difficult to persuade men who were not in a good financial position to remain at the school to continue their studies; and the Manchester Education Committee had recently decided to increase the amount allowed for research work.

Dr. LOUIS (Newcastle-on-Tyne) said he was not in agreement with the proposal to provide libraries for particular industries at the public expense. If the merchant princes of this conntry were approached in a right manner, all the necessary money would be forthcoming. He was opposed to central authorities, or the Government being called upon to do the work.

Sir WILLIAM RAMSAY said it was important there should be no overlapping. What was required was a scheme of centralization. He referred to the existence of the technical library at the Manchester University.

Dr. FORSTER, in replying on the discussion, said it was practically impossible for a Society such as the Chemical Society to establish a bureau on the lines suggested. It would cost at least £5000 a year; and the scheme would have to be worked on a systematic basis. It would, however, be of enormous value to the country if only for the fact that the Government would have become permeable by the scientific idea. [Laughter.]

### RESOLUTION AS TO LIBRARIES.

The PRESIDENT read the following resolution, and expressed the hope that it would be passed without dissent:

> "That, in the opinion of this meeting, Central Technological Libraries, complete in all respects as regards patent literature, British and foreign journals, and text-books, should be founded at the public expense in all great centres of industry, and that such libraries should be arranged on lines similar to those of the Patent Office Library in London."

The members, however, did not approve the full terms of the resolution; and in the end the meeting unanimously adopted the following:—

> "That this meeting is of opinion that the establishment of Technical Libraries throughout the country is of urgent National importance."

After the reading of the papers,

Sir WILLIAM RAMSAY said they all knew that a good many mistakes had been made in the past. They must not, however, trouble

about past mistakes, but try and do better in the future. It appeared to him that the author was perfectly right in saying that what was required was a Government Department which could deal sensibly with scientific progress and operations of all kinds. This ideal might be cherished; but he was afraid it was impossible of achievement—at any rate, by political means. Still, there existed the Royal Society, one of the most ancient institutions in the country, which enjoyed royal patronage, and received assistance from the Government. It was a means of communication between the outside world and the scientific world.

Professor LOUIS, referring to the importance of research work, said it was essential that professors should be consulted on industrial problems of the day. He made it a condition, before accepting the chair at Newcastle, that he should be allowed consulting practice, because if a man did not keep himself informed of the industrial problems of the day he very quickly dropped out of touch with what was going on. If they were consulted on these urgent industrial questions, they kept up-to-date; but if they were not, there would be nothing in text-books to guide them. Much valuable time would therefore have been lost, because by the time a thing got into the text-books it had probably been replaced by something better. Regarding Professor Armstrong's suggestion with regard to a small tax on coal and iron products, to be applied for the advancement of research work, some four or five years ago he was consulted by the coalowners of South Wales regarding technical education in coal mining, and the question of cost cropped up. He suggested to the owners that they should commence to tax themselves one-tenth of a penny a ton on the output in order to carry this into effect. This was agreed to, and to-day the greater portion of the coal output of South Wales was voluntarily taxed to the extent he mentioned, in order to maintain technical instruction in South Wales.

Dr. GILBERT J. FOWLER (Manchester) said that in their endeavour to organize themselves they should not forget that after all organization carried to its highest point without intelligence would not take them very far.

Professor BONE said he thought we English people necessarily took a pessimistic view of our performances, our capabilities, and our prospects as an industrial nation. After all, in the ultimate analysis, we had been, and were still, the greatest and most successful nation in the world if taken per head of the population. It had been shown, and it could still be shown, that we bought more, sold more, and made more per head of the population than any other industrially organized nation. We had done this for the last fifty years, and we were not relatively losing our place. The aniline dye industry had been quoted as an instance where we had lost an industry through what was sometimes termed our incapacity to apply science to a particular industry. It was true in this particular branch. Nevertheless, he believed that if the whole output of what were termed chemicals was taken into consideration, it would be found that we were turning out as much per head of the population as the whole of Germany—a place where chemical industries were regarded as being most efficiently carried on. Again, the financial basis of our industry was very much sounder than that of Germany.

VISIT TO THE UNIVERSITY LABORATORIES, &c.

During the conference the visitors availed themselves of an invitation to visit the Manchester University Laboratories, where demonstrations were carried out by Professors Harold Dixon, F.R.S., W. J. Pope, F.R.S., and Sir Ernest Rutherford, F.R.S. They also visited various corporation undertakings, in Manchester and Salford, besides inspecting some well-known Manchester engineering establishments.

The PRESIDENT (Professor Henderson) said he was sure the members would, in traditional manner, express their best thanks to the readers of the papers.

This was carried by acclamation, and the proceedings closed.

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**Advisory Council on Munitions.**—An Advisory Council (who held their first meeting a week ago) have been appointed to assist the Ministry of Munitions with reference to matters affecting munitions of war, the employment of workmen, the enrolment of volunteers and their transference to other districts, and the classification and co-ordination of all the various workers connected with industries where munitions of war have to be produced. The members of the Council include Sir John Aird, Mr. W. H. Cowan, M.P. (of Messrs. Parkinson and W. & B. Cowan), Mr. Alexander Duckham (brother to Mr. A. M'D. Duckham, of Westminster), and Sir G. C. Marks, M.P. (Messrs. Marks and Clerk).

**Commercial Intelligence Committee.**—At a meeting last Tuesday of the Advisory Committee to the Board of Trade on Commercial Intelligence, it was reported that the number of written and personal inquiries received at the Commercial Intelligence Branch in the first half of this year was 28,500, as compared with 9400 in the corresponding period of 1914; while the number of firms on the Special Register at the end of June was 3128, against 1645 at the same date last year. Reports were presented to the Committee on the series of exchange meetings instituted by the Board of Trade to bring to the notice of British manufacturers samples of goods formerly supplied by enemy countries to the United Kingdom and neutral markets, and on the British Industries Fair held in May. The Committee approved the decision of the Board of Trade to organize a second fair next year.

# CORRESPONDENCE.

*[We are not responsible for opinions expressed by Correspondents.]*

## Gas-Mantles Made in Holland.

SIR,—In connection with the correspondence of the Manager of the Volker Lighting Corporation, Limited, in the issue of the "JOURNAL" for the 6th inst., it may be of interest to your readers to learn that at the beginning of the war, when several Dutch mantle manufacturing works were started, one of these was also erected in the immediate vicinity of our Western Gas-Works, and has been working ever since. This factory consumes weekly between 2400 and 2500 cubic metres of Amsterdam gas, which means that this single manufactory has a yearly consumption of more than 4 million cubic feet of gas. Of course, this is but a trifling part of the hundreds of millions of cubic feet of gas accounted for in Amsterdam.

As to the shortage in gas coals, I can only say that up to the present time, in Amsterdam as in other large Dutch towns, no special measures have been taken to limit the delivery of gas to private consumers. Gas coals, however, are scarce and dear—more licences being desirable.

Then we come to the question of the Ramie yarn. Ramie is a fibre, cultivated and produced in the Dutch East Indies—more specially on Sumatra and Java. The fibre is, however, spun to yarns in our own Dutch spinning mills.

J. VAN ROSSUM DU CHATTELL,
General Manager of the Amsterdam Gas Department.

*Amsterdam, July* 13, 1915.

## Trench Work.

SIR,—I have naturally read with interest the "Editorial" in your issue of the 13th inst., on the paper presented by me at the annual meeting of the Institution of Municipal and County Engineers.

You are quite correct in your statement that I set out to consider how best the relations of pipe-owners and road authorities can be improved. I did this because I think that there is room for improvement, which thought is amply borne out by the remarks contained in your "Editorial." My paper was prepared without bias in favour of either "road makers" or "road breakers;" and it put forward, briefly, certain suggestions as to remedies.

An Act of Parliament is one thing and actual requirements are another, and in many instances quite different. The fact remains that statutory companies and others on the one hand have certain restrictive rights to open highways and reinstate and maintain the portion disturbed, while on the other hand road authorities have their duties to perform. If it is possible to remove the need, as you put it, of "additional powers of regulation and charges in connection with pipe work—most of them unduly burdensome, inequitable, and altogether unnecessary"— then by all means do so, but with due consideration for both sides.

One is delighted to hear that owners of subterranean pipes are quite willing to enter into any arrangements with the road authorities; and of this—as stated in my paper—I am quite convinced. There should be no difficulty as to the arrangements being to the mutual advantage of both, without any additional expense being put upon either. But both of them must agree on the course of action to be followed, if satisfactory results are to be attained. Companies supply products for (among other things) the benefit of the public; and as they are also large ratepayers, they share the burden of the cost of the highways. But I think they will agree that no body of persons should be permitted to do something which, by reason of doing it, would entail greater expense upon, and inconvenience to, the ratepayers generally; neither, on the other hand, should the demands of the road authorities be greater than the persons interfering with the highways ought, within reason, to comply with at the expense of a particular undertaking supplying the wants, it may be, of a particular few or many.

I am afraid that a letter would be too lengthy a method of explaining, in detail, the force and effect of my suggested remedies; but if of interest to your readers, as appears from your "Editorial," I shall be pleased to return to the matter in another issue.

REGINALD BROWN,
M.Inst.C.E., M.I.Mech.E., F.S.I.,
M.Inst.M.&C.E., F.R.San.I.

*Old Queen Street, Westminster, S.W., July* 14, 1915.

[After a long parliamentary experience of the requirements of some road authorities in connection with the laying, and the alteration of the position, of gas and water pipes, and of the bland and cool assumption that all attendant expenses whatever these requirements, whatever their cause, however unreasonable or arbitrary, should be borne by the pipe owners, it is refreshing to have Mr. Reginald Brown's letter, which expresses his conviction that arrangements between the parties could be made which would be to mutual benefit, without any additional expense to one or the other. We should be pleased to have Mr. Brown's ideas elaborated in the form of an article, because this is a matter of the utmost importance to the owners of distribution systems for such public services as the supply of gas and water. Although our correspondent refers to "mutual advantage" and "additional expense" in the next passage, the following statement, standing alone, does not completely represent a point which we made last week: "One is delighted to hear that owners of subterranean pipes are quite willing to enter into any arrangements with the road authorities." Our statement, with the qualifications, was: "Let us preface comment with the remark that the owners of

subterranean pipes are quite willing to enter into any arrangements with the road authorities which will be to their mutual advantage, but would strongly resent additional expense being put upon them—that is, expense beyond what they at present incur—unless it is shown they are going to derive compensatory advantage from it." Mr. Brown has not evaded the qualifications; but he disjoints them from the original context, and so somewhat alters the complexion of our statement.—Ed. J.G.L.]

## Meter Rents in the South Suburban District.

Sir,—*A propos* the article on meter-rentals in the South Suburban Company's district, is it not a fact that in the Company's original district a uniform rental for all sizes of meters has been in force for many years past? Otherwise the rental we have paid here for ten years for a 20-light meter is unusually low—9d. a quarter. In Westminster, a 20-light meter costs 2s. a quarter; and a 10-light one, 1s. 3d.

I imagine that many consumers will hold their hands and force the Company, if they wish to charge 1s. 6d. a quarter, to give a quarter's notice to terminate the existing agreement. In order to save the trouble and expense of preparing new agreements, the Company may ask consumers to sign an undertaking to agree to this alteration of the old terms as from the termination of the quarter's notice.

This procedure is being followed by the Westminster Electric Supply Corporation, which has sent with the accounts for last quarter a notice that it has found it necessary—on account of dear coal—to increase the charges for electricity by 10 per cent. [Whether the increase applies to meter-rents as well as current per unit is doubtful.] It therefore gives formal notice that at the end of three calendar months the existing agreement will terminate, and asks consumers to sign and return, within fourteen days, an undertaking to pay after the expiration of three months an increased charge of 10 per cent. on the prices fixed in the agreement.

*July* 17, 1915. Norwood.

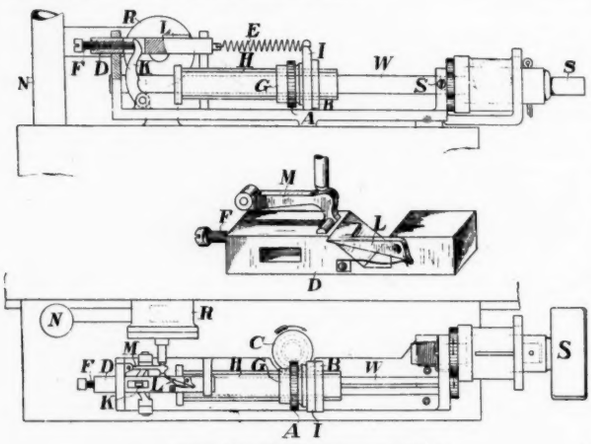
# REGISTER OF PATENTS.

## Prepayment Gas-Meters.

Julius Pintsch, of Vienna.

No. 2652; Feb. 2, 1914. Convention date Feb. 1, 1913.

This invention relates more particularly to that type of coin-freed meter in which the opening of the valve for controlling the flow of the gas is effected by the setting or adjustment of a quantity mechanism and the closing of the valve is automatically effected, partially by the action of the meter and then completely and rapidly by a device operating independently of it. The gas-valve is held in its open position against the action of a spring or weight by a lever pivoted in the frame until one end of the lever bearing against a slide is shifted at the end of the gas delivery period—being lifted out of the recess on inserting a coin and moving back the slide.




**Julius Pintsch's Prepayment Meter.**

An elevation and plan of an embodiment of the invention are given; also a perspective view of a detail.

The coin-actuated device (of well-known construction) operates in the usual manner. By turning the key S a shaft W is turned through the medium of pinions, which may be removed and replaced by others. Lengthwise movement of the shaft is prevented by a collar or circumferential groove on it and a pin engaging with it. A sleeve H (having cut upon it a screw-thread of predetermined pitch) is adapted to slide lengthwise on the shaft, and is provided with an inwardly projecting pin engaging into a longitudinal groove in the shaft so that the sleeve revolves together with the shaft, but may also move lengthwise of it. G is a sleeve provided with an internal thread fitting the screw thread on the sleeve H and with a worm wheel A on its outside. The sleeve is prevented from moving lengthwise by a flange B engaging with the bearing I, but is free to turn. A worm C, driven by the meter drum, meshes with the worm wheel A.

As the sleeve H is turned, together with the shaft W, while the sleeve G is prevented from turning by the worm wheel engaging into the worm C, the sleeve H must screw into the sleeve G moving longitudinally towards the coin insertion, and through a distance corresponding to the number of coins inserted. The worm C, driven by the meter drum, drives, in turn, the sleeve G through the medium of the worm wheel A, causing the sleeve H to move longitudinally in the opposite direction—that is to say, towards the valve V; and in this return movement, and before reaching the end of its course, the sleeve H causes the valve to close. This method, and the devices required therefor, form the object of the present invention.

In two standards at the valve end of the frame a slide D is mounted and acted upon by a coiled spring E, tending to draw the slide towards the coin-insertion end of the device. An arm K, pivoted in the frame and adapted to be adjusted by a screw, engages into a slot of the slide. The sleeve H, on being moved towards the left, turns this arm, and therefore also moves towards the left the slide D against the action of the spring E. In the slide D a wedge-shaped recess is provided which is partly covered by a spring-actuated finger pivoted to the slide. One end of a lever M pivoted in the frame bears against the slide D. The gas flows through the usual supply pipe N to the valve casing, and thence (when the valve is open) to the meter drum. The valve is provided with a spring tending to close it; and the valve spindle abuts against the lever M.

When the slide D is moved towards the left by the sleeve H and the arm K, one end of the lever M first slides along the slide and then, with a lateral projection, over the part of the finger L covering the wedge-shaped recess of the slide D, and is finally forced into the recess by the valve spring. The valve is thus closed and the apparatus stopped. If, now, a coin is inserted, and the sleeve H is pushed back, the lever K is released and the spring E draws the slide towards the right, the end of the lever M slides upwards along the inclined side of the wedge-shaped recess, and the projection lifts the finger L, whereupon the finger again closes on the wedge-shaped recess after the lever M has returned to its normal position—the valve being opened again. Thus the valve is closed suddenly, and when closed it is no more dependent of the automatic device. But by inclining the upper face of the finger L, a closing movement may be imparted to the valve which is at first gradual, whereby the consumer becomes aware that the gas delivery is about to be shut off. By adjusting the screw F the moment of the complete closing of the valve may be adjusted.

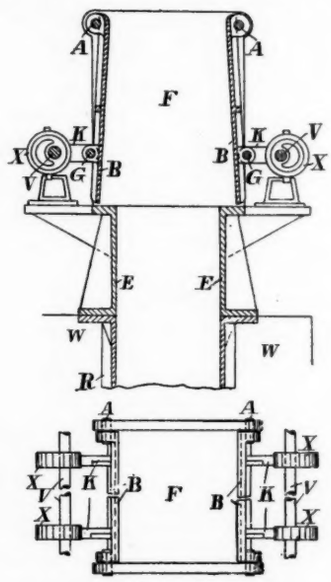
## Charging Vertical Retorts.

Heiderich, E., of Zeebrugge, Germany.

No. 7573; March 25, 1914.

The object of this invention is generally applicable, but is more specifically intended, for use with vertical retorts, which is to supply the coal to the retort in compressed and shaped form.

The patentee remarks: In a horizontal coke-oven it has been proposed to force the coal through a chamber having fixed tapered walls to produce a compacted mass, into a preheating chamber by a plunger, and thence to the oven—the side and top walls of the preheating chamber being somewhat inset with respect to the corresponding walls of the oven, so as to give clearance spaces at the sides and top of the mass of coal advanced from the preheating chamber into the oven.




**Heiderich's Vertical Retort Charger.**

According to the present invention, the filling hopper is provided with movable side walls, which, in their motion compress the fuel and shape it into a form corresponding substantially to the cross section of the retort—like a briquette or cake, the cross-section of which, although corresponding in shape to the retort, is preferably slightly less than the cross sectional area of the retort, so as to allow for expansion. The shape of the side walls, which are movable, depends upon the shape of the retort, and they "are preferably arranged to exercise an increasing amount of side pressure on the body of the fuel descending through the hopper into the filling spout of the retort," by a "suitable inclination or tapering of the walls." The progressive application of side pressure is said to have the effect of "producing a relatively firm and cohesive block with smooth side surfaces, and with an internal structure which is not readily disturbed or broken up by the increasing

heat owing to the expulsion of the bulk of the air from between the interstices of the fuel."

The illustration shows a section through the filling spout and feed hopper according to the present invention, and a plan of the device as applied to a vertical retort of rectangular cross section.

The retort walls are indicated at W. A space R is left between the retort walls and the filling piece E for the outlet of gas. On the top of the filling piece are provided ledges to support bearings for two transverse shafts V, which have mounted on them eccentrics X connected by links K to movable side walls B of the filling hopper F. The links are pivotally connected at G to the movable side walls.

In the form illustrated, the movement of the side walls is an oscillating movement about centres or pivots A, arranged at the upper end; while the connections from the eccentrics X are located near the lower ends of the walls B. By means of this device the amount of lateral movement of the walls (which, of course, determines the degree of side pressure applied to the fuel) increases as the fuel moves downwards away from the centre of oscillation A. The amount of side movement, and consequently the amount of side pressure, applied is, therefore, a gradually increasing one; so that the air in the interstices between the particles of fuel is expelled, and the fuel (before its entry into the filler E and retort W) is brought into the form of a more or less cohesive block.

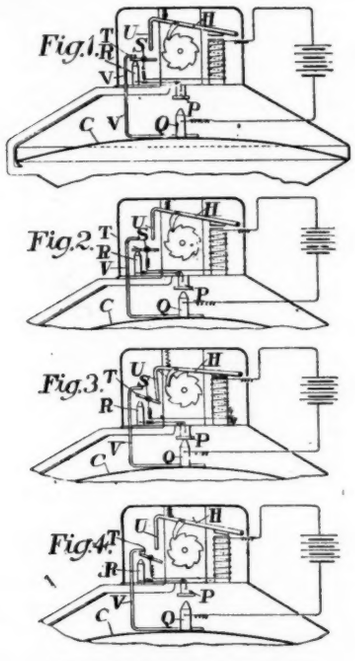
With retorts working continuously, a continuous block would be formed "which has an advantageous effect on the distillation, owing to the uniformity obtained." In horizontal or inclined retorts the device is arranged in front of the filling hopper.

## Lighting Gas-Lamps from a Distance.

WESTF. GASGLÜHLICHTFABRIK F.W. and KILLING, C., of Hagen, i.W.-Delstern, Germany.

No. 7798; March 27, 1914. Convention date, May 9, 1913.

This invention relates to devices for lighting gas-lamps from a distance, in which the gas-cock is opened and closed by an electro-magnet, the circuit of which is closed as the result of a temporary rise in pressure in the gas-main.




**Killing's Pressure Lamp Lighter.**

One example of the apparatus is diagrammatically represented "in its essential parts and in various positions of operation."

Fig. 1 illustrates the device in its normal position—*i.e.*, with normal gas pressure and the diaphragm in its lowest position. The contact device R S is closed, and the circuit is open at P Q. When it is desired to light or extinguish the lamp by turning the gas-cock, the gas pressure is increased; and consequently the diaphragm C rises, the contact pin Q approaches the plate P, and the bent member V allows a free path for the contact lever S (fig. 2). When the pressure has risen to such an extent that the two contact pieces P Q touch one another, the circuit of the electro-magnet is immediately closed; and, by means of the latter, the actuating lever H (fig. 3) is attracted downwards with simultaneous rotation of the gas-cock. When the lever H moves downwards, its downwardly bent end U strikes against the rear end of the contact lever T, and consequently opens the circuit of the electro-magnet. The contact lever T tends, in virtue of its own friction, to remain in the slanting position, so that at this place the circuit is held open during the downward movement of the membrane, and which movement starts only gradually. Any subsequent undesired contacts made by the contact-pieces P Q are thus altogether without effect. Only when the diaphragm, as shown in fig. 4, has moved so far down that undesired contact between the contact-pieces P Q is impossible, is the contact lever T of the auxiliary switch pulled down by the bent member V, owing to the further downward movement of the diaphragm —the contact lever being thus returned to the normal position as shown in fig. 1, and the auxiliary contact device being in consequence again closed.

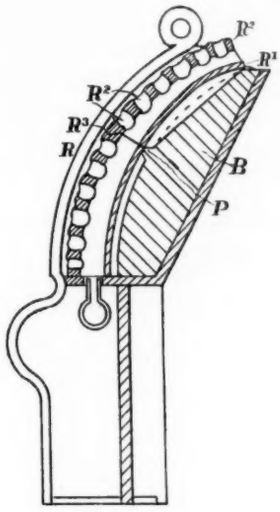
## Gas-Fires.

WILSON, W. A., of Armley, near Leeds.

No. 15,978; July 4, 1914.

The object of this invention is "to construct a gas-fire specially adapted for standing on the hearth and fitting into fireplaces or well-grates and occupying the same position, and to a great extent giving a contour and appearance similar to a coal-fire—said gas-fire, in addition, having a high radiant efficiency."

The patentee says that in carrying his invention into effect he first made a number of experiments to find out the lowest curve which a preferably well-aërated flame would take when burning in the vicinity of a solid body, and afterwards determined the increased effect of a tubular construction placed around the flame. In this way, he found what was the correct lowest curve to construct the gas-fire according to his invention.




**Wilson's Gas-Fire.**

In one form he surrounds a flame, or series of flames, with a fire-clay or like tubular radiant or radiants having open fronts $R^2$ and substantially solid backs $R^1$; the backs deing shaped first in the same direction as the initial direction of the flame and then gradually curved backwards—becoming more horizontally inclined towards the top. On the front or inner surface of the back of the radiants there are formed small ribs, nipples, or like projections (such as have hitherto been proposed) so made as not to interfere with the attraction of the flame towards a solid surface, or the flue-like action of the radiants. Behind these radiants is placed a fire-brick or other back B, to prevent loss of heat behind the fire—such back being kept a distance away from the radiant by projections P on which the radiant can be supported. The space thus formed between the fire-brick back and the radiants prevents loss of heat by conduction.

In another form the invention comprises a flame, or series of flames, arranged with a fire-brick back B shaped as the solid back of radiants (as previously described) and having a fire-clay open-fronted channel radiant or series of radiants—that is, radiants without backs—arranged to fit or lay on to the front of the fire-brick and give the formation described with reference to the first form.

In making radiants for any of the fires described, a number of tubes may be formed joined together and an upper set rest on a lower—a suitable joint being formed, as at $R^3$. With a properly-constructed radiant there is said to be no escape of flame through the front of the radiants, which become heated internally throughout their length. Such a fire, being of a less height than the general type of gas-fire, is intended to fit into a well or coal grate and give the appearance of a deep fire. The radiants are disposed in relation to the flame in such a way that they "in no way impede or check the flame, and so do not interfere with efficient or complete combustion."

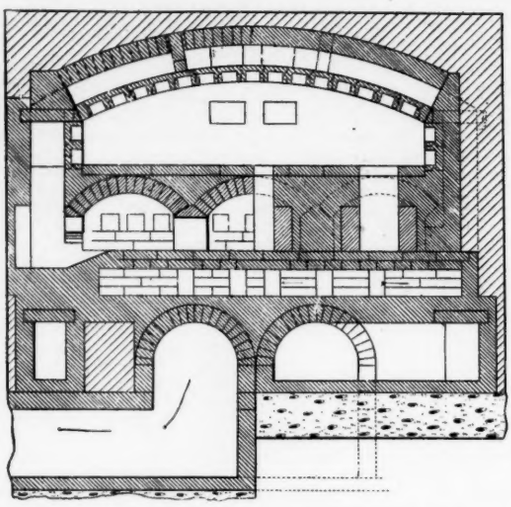
## Gas-Heated Annealing Furnaces.

GIBBONS BROS., LIMITED, MASTERS, R., and VAN MARLE, M., of Lower Gornal, Staffs.

No. 18,346; Aug. 7, 1914.

This invention has reference to gas-heated convertible furnaces for annealing metals—of the kind which is arranged so that the same furnace can be used either for close annealing with the flames passing around the annealing chamber or for open annealing with the flames passing through the annealing chamber.

According to the invention, one or more longitudinal combustion chambers receiving gas and heated secondary air are provided (underneath the annealing chamber) in which the combustion of the gas and secondary air takes place. The combustion chambers have two sets of outlet heat flues or passages; one set leading to the interior of the annealing chamber near the front end, and the other set leading up and along heat flues at the side of the annealing chamber over and through the hollow arched top of it. The outlet passages are controlled by dampers, which can be so manipulated as to cause the heat to either enter the annealing chamber and travel through it and through outlets at the back when used as an in-fired annealing furnace, or, when the dampers are closed, other dampers are opened and the heat can pass through the other passages and side flues and through the hollow



Gibbons, Masters, and Van Marle's Gas-Heated Annealing Furnaces.

arched top of the annealing chamber for close annealing. From the back of the hollow arch of the annealing chamber, and from the back of the interior of the annealing chamber, there are outlet passages separately controlled by dampers and leading to flues connected with waste-heat flues leading to the main flue to the stack. The secondary air is heated by passing through tortuous passages underneath the combustion chambers. Thus, by merely opening or closing the necessary dampers, the heat can be caused either to enter and pass through the annealing chamber, or, for close annealing, to pass up and along the hollow sides and through the hollow arched top of the annealing chamber.

The annealing furnace combined with a gas-producer is by preference constructed and arranged as shown in cross sectional elevation.

## Rotary Gas-Engines.

MORGAN, C. W., of Racine, Wisconsin, U.S.A.

No. 19,640; Sept. 10, 1914.

The object of this invention is to provide a "simple, economical, and highly efficient" valveless gas-engine of the type wherein a rotor works within a cylindrical shell and is provided with means whereby a combustion charge is induced into a chamber formed between the rotor and the interior wall of the cylindrical shell and is then compressed into a combustion chamber or gas pocket formed in the periphery of the rotor.

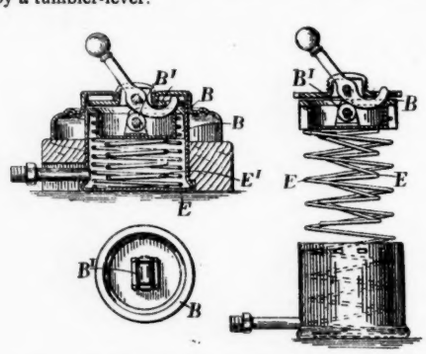
Hitherto in such apparatus the power impulse due to the firing of the compressed charge has been taken upon outwardly sliding vanes; and it is said to be an important feature of the invention that pivoted or hinged pistons or explosion vanes are employed. A further important feature consists in the provision of means whereby the combustible supply is introduced into the receiving chamber from a centrally situated head to which the combustible charge is supplied by means of a supply pipe or the like.

## Pneumatic Switches for Operating Gas-Valves.

EDWARDS, A. N., of Farringdon Street, E.C.

No. 20,894; Oct. 12, 1914.

This invention relates to pneumatic switches for operating gas-valves from a distance, of the type in which there is a spring-returned plunger working in a barrel and driven inwards by a cam usually operated by a tumbler-lever.




Edwards' Pneumatic Switches for Gas-Lights.

Illustrations are given of a sectional side elevation of one construction of the switch shown complete; a plan of the plunger; and a side elevation of the working parts partially disassembled.

In the construction shown, two concentric returning springs E E¹ are provided. The outer one E is a long parallel spring and easily compressible. As the end turn of this spring bears upon the plunger B near its periphery, it assists in preventing the jamming of the plunger. The short inner spring E¹ (stiffer than the other spring) is secured at one end to the plunger; while the other end bears against the bottom of the barrel, on which it is maintained concentric by a slightly raised portion. The spring is of such length as not to be appreciably compressed when the plunger is in its outermost position; and therefore it does not appreciably oppose the initial part of the inward movement of the plunger. In order to obviate any tendency of the springs to cause the piston to work round in the cylinder, so that the cam-roll B¹ is not square with the cam, the two springs are coiled in opposite directions.

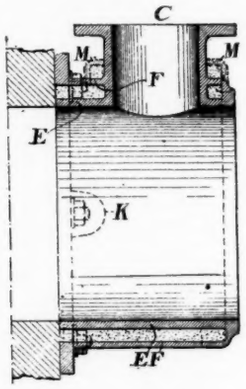
The plunger is specially formed with a central recess to receive the cam-roll or butting-piece, and an annular recess in the other face to receive the long parallel spring E. The recesses are constituted by an upstanding rim of inverted U-shape. The parallel springs will not collapse so flat as the conical spring previously used, but the annular recess provides space to receive the spring when compressed without rendering the switch bulky.

## Retort Mouthpieces.

NÜBLING, R., of Stuttgart, Germany.

No. 23,542; Dec. 4, 1914. Convention date, Jan. 23, 1914.

In the mouthpiece of gas-retorts, the patentee notes, the gases coming from the retort are cooled considerably before they pass to the outlet pipe, owing to radiation of heat by the mouthpiece, which is "more particularly disadvantageous as the cooling produces a diminution of pressure, and consequently air is liable to be drawn in through leaky points at the seat of the retort cover." Recognizing that it is very important to have protection from heat just at the gas outlet point, a heat-insulating packing is suggested by the patentee by making the mouthpiece with double walls—the heat-insulating or non-conducting mass being rammed into the hollow spaces. In doing this, "it has been taken into account that the non-conducting mass, once filled in, must be permanently protected from mechanical injuries and effects of working, by making the hollow spaces for the non-conducting mass accessible only from the flange side adjoining the front wall of the retort."




Nübling's Retort Mouthpiece.

The mouthpiece shown is secured to the front end of the retort (as shown) by means of nuts. It is provided with a gas discharge branch C, and double walls E F, the hollow space formed by which is filled with a non-conducting packing—for instance, with "kieselguhr"—rammed in through the core holes of the flange. The holes are also filled with the heat-insulating mass, and are closed air-tight by a layer of cement between the retort and the flange. The inner space of the mouthpiece is thus protected by the packing from excessive cooling, and at the same time "the injurious radiation of heat near the mouthpiece is reduced as far as possible." The two walls meet at the point where the fixing screws are arranged, in such a manner as to produce recesses K for the mouth of the spanner for tightening or loosening the fixing nuts.

As shown, the outer walls F could also be provided, at the point where the branch C passes through the walls, with a hollow annular projection M surrounding the branch and filled with the non-conducting mass, in order also to reduce as far as possible the heat radiation of the branch.

## APPLICATIONS FOR LETTERS PATENT.

9757.—KEITH, J. & G., "Rotary blowers." July 5.
9780.—CISELET, E., and DEGUIDE, C., "Purification of gas." July 5.
9905.—HUNTER, C. M., "Gas-burners." July 7.
9908.—NEULAND, A. H., "Lighting and ignition systems." July 7.
9911.—FISHER, J., and FIDDES, W. J., "Removing matter from gas." July 7.
9946.—KEITH, J. & G., "High-pressure gas lighting." July 8.
9988.—HALL, L., "Burning gas." July 9.
10,022.—LESSING, R., "Extraction and recovery of vaporous constituents from coal gas." July 9.
10,058.—GIBBONS BROS., LTD., and MASTERS, E., "Discharging retorts." July 10.
10,066.—MOSS, G. L., and the SIMON-CARVES BYE-PRODUCT COKE-OVEN CONSTRUCTION AND WORKING COMPANY, LTD., "Purification of benzol." July 10.
10,074.—ETNA LIGHTING AND HEATING COMPANY, LTD., and PROSSER, H. R., "Bunsen burners." July 10.

# PARLIAMENTARY INTELLIGENCE.

## HOUSE OF LORDS.

The following progress has been made with Bills:—

Bills reported, with amendments: Gas and Water Provisional Orders (Nos. 1, 2, and 3), Metropolitan Water, Rhondda Urban District Council, Weardale and Consett Water.

Bills read the third time and passed: Barnoldswick Water, Southend Water.

Bills Royal Assented: Chelmsford Gas, Irvine and District Water, Kilmarnock Gas, Lurgan Urban District Council, Northwich Gas, Prescot Gas, Skegness Gas, Spennymoor and Tudhoe Gas, Sutton Water.

The Glasgow Corporation Bill was brought from the Commons, read the first time, and deemed to have been read a second time and reported from the Committee.

The Durham County Council have deposited a petition against the Weardale and Consett Water Bill.

## HOUSE OF COMMONS.

The following progress has been made with Bills:—

Bill read a second time: Irvine and District Water.

The Northwich Gas Bill [Lords] and the Sutton Water Bill were read the third time and passed with amendments.

The Glasgow Corporation Bill and the Irvine and District Water Board Bill were read the third time and passed without amendment.

The House was informed that the Lords had agreed to the Barnoldswick Water Bill and the Southend Water Bill with amendments; the Northwich Gas Bill without amendment.

## PRICE OF COAL (LIMITATION) BILL.

The following Bill, to provide for the limitation of the price of coal, was presented by Mr. Runciman [supported by Mr. Pretyman] in the House of Commons last Tuesday.

1.—(1) Coal at the pit's mouth shall not be sold or offered for sale by the owner of the coal, or on his behalf, at a price exceeding by more than the standard amount per ton the price of coal of the same description, sold in similar quantities, and under similar conditions, at the pit's mouth at the same coal mine on the corresponding date (or as near thereto as, having regard to the course of business, may be practicable) in the twelve months ended the 30th day of June, 1914 (in this Act referred to as the corresponding price).

(2) The standard amount shall be 4s., provided that the Board of Trade may, by order, if they are satisfied, as respects any class of coal mines specified in the order or the coal mines in any district so specified, that, owing to special circumstances affecting those mines, the standard amount of 4s. should be increased, substitute for that amount such higher sum as they may think just in the circumstances; and as respects those mines, this Act shall have effect as if the higher sum so substituted were the standard amount.

(3) If any person sells or offers for sale any coal in contravention of this section, he shall be liable, on summary conviction, to a fine not exceeding £100 or, at the discretion of the court, to a fine not exceeding treble the amount by which the sum paid, or payable, for any coal sold by him in contravention of this section exceeds the maximum sum which would have been paid, or payable, for the coal if there had been no contravention of this section.

(4) This section shall apply to a case where the owner of coal at the pit's mouth has sold, or offered to sell, that coal at a price which includes the cost of railway or other incidental services besides the actual value of the coal at the pit's mouth, as if he had sold, or offered to sell, at the pit's mouth at a price reduced by an amount representing the cost of those services.

2.—(1) If in any proceedings for the recovery of a fine under this Act any question is raised as to the corresponding price of any coal (including any question as to the cost of railway or other incidental services), the Court shall refer the question for determination by the Board of Trade; and the decision of the Board shall be final and conclusive for all purposes.

(2) If for any reason there are not adequate data at any coal mine from which to ascertain, in accordance with the foregoing provisions of this Act, the corresponding price at that mine, the Board of Trade may fix that price having regard to data afforded from sales of coal at other mines.

(3) The Board of Trade may require the owner of any coal mine to furnish such information as appears to them necessary for the purpose of carrying into effect this Act; and if any person refuses to furnish any such information when so required, or furnishes information which is false in any material particular, he shall be liable on summary conviction to a fine not exceeding £100.

(4) The Board of Trade Arbitrations, &c., Act, 1874, shall apply as if this Act were a Special Act within the meaning of the first-mentioned Act.

3.—(1) This Act shall not apply to any sale of coal for export, or to any sale of coal for the manufacture of patent fuel for export, or to any sale of coal to be used on any ship.

(2) This Act shall not apply to the sale of coal supplied in pursuance of a contract made before the commencement of this Act.

(3) This Act may be cited as the Price of Coal (Limitation) Act, 1915.

(4) This Act shall have effect during the continuance of the present war and a period of six months thereafter.

## LINCOLN CORPORATION BILL.

This Bill was last Wednesday sent forward for third reading by the Unopposed Bills Committee of the House of Lords. The gas clauses were set out when the Bill was before the Local Legislation Committee of the House of Commons. [See "JOURNAL," May 11, p. 340.]

## SOUTHAMPTON ELECTRIC LIGHTING ORDER.

### "Northumberland Clause" Granted.

### HOUSE OF LORDS COMMITTEE.—Thursday, July 15.

(*Before Viscount* BRISTOL, *Chairman*, *Lord* BARRYMORE, *Viscount* FALKLAND, *the* EARL OF MAYO, *and Lord* BATEMAN.)

This Order, which is contained in the Electric Lighting Provisional Orders Confirmation Bill No. 3, deals with an extension of the Southampton Corporation electric supply area. The proceedings in the House of Commons were fully reported in the "JOURNAL" for June 29, p. 763.

Counsel for the Corporation were Mr. VESEY KNOX, K.C., and Mr. TYLDESLEY JONES. The opponents, the Southampton Gaslight Company, were this time represented by Mr. HONORATUS LLOYD, K.C., and Mr. A. M. PADDON.

Mr. VESEY KNOX stated the object of the Order in much the same terms as when the Bill was before the House of Commons. Briefly, the Corporation seek to add to their electric lighting area the district of Bitterne; and the Gas Company asked that the "Northumberland Clause" should be applied to the whole of the Southampton electric supply area. Complaint was again made that the Gas Company should have pursued the Corporation from the Board of Trade to the House of Commons and now to the House of Lords; Counsel submitting that the only reason for the opposition could be because the Corporation electrical undertaking had now become such a serious competitor with the Gas Company that the latter desired to hamper the Corporation in every possible way. Furthermore, the Company was a maximum-price concern, and well able to pay their maximum dividends. So that the cost of this opposition would fall upon the consumers of gas in Southampton, and not upon the shareholders, as would be the case if the Company were under the sliding-scale. The object, effect, and history of the Northumberland clause was then fully explained to the Committee. It was argued that while the clause might be perfectly reasonable in the case of small undertakings, it was both mischievous and annoying in the case of large industrial towns such as Southampton, and, indeed, practically unworkable if imposed. The main argument against the clause in large towns was that it interfered with the making of long-term power contracts, inasmuch as the clause provided that when at any triennial revision the price to "ordinary" consumers was increased, in order to prevent any loss upon the undertaking, the price for power should be proportionately increased. The Company took it that "ordinary" consumers meant lighting consumers; and upon this basis it would be seen how absurd the clause was. With lighting consumers, the chief cost was distribution, and it might be fair and reasonable, if (say) the half-watt lamp was developed so that it could be used for ordinary houses in small sizes, to increase the lighting charge because the consumption of current for the same amount of light would be halved. This consideration did not apply to power. Yet, under the clause, the power charges were to be increased in proportion to the increase in the lighting charge. This made it practically impossible to enter into large power contracts. As a matter of fact, only one large town had attempted to work the clause, and that was Huddersfield. But they were now having considerable trouble with their power contracts. At Southampton, one large power contract had been entered into with the Pirelli General Cable Works, and it was hoped to introduce other industries into the town. This, however, could not be done if manufacturers were asked to bind themselves to take current for a long period of years, leaving the Corporation free to vary the price every three years. The clause was not in operation in very many places—in fact, most of the recent new undertakings upon which it had been imposed had never started operations. The Board of Trade had refused to grant the clause in this case, and he asked the Committee to support their view, on the ground that the Southampton electrical undertaking was so flourishing that it would unduly hamper the Corporation in making large power contracts.

Sir *John Snell* gave evidence in support.

In cross-examination by Mr. HONORATUS LLOYD, witness mentioned that whereas he was at one time in favour of the clause, he had changed his opinion since he had had to study the practical effect and advise a leading gas company in relation to an endeavour to put the clause into effect in a London borough. The electrical undertaking in question was making a loss, and the conclusion he had now come to was that if the clause were enforced the loss would be greater, and the position of the Gas Company, as ratepayers, would be worse than ever. Counsel put to witness several instances of large towns where the clause had been inserted; but he said he was not aware of the fact. He was not prepared to accept the clause for Bitterne only.

This closed the case for the Corporation.

Mr. HONORATUS LLOYD, who did not call evidence, addressed the Committee. The position, he said, was that the Southampton Corporation, having been permitted to work an electrical trading undertaking in the borough, now sought to go outside the town. Parliament had hitherto said, after considering the matter for years and years, that if corporations were to be allowed to set up trading undertakings they should do so upon fair terms. From the very early days there had been, and still was, the keenest competition between electrical and gas undertakings. If the latter had not been able to turn their utility into fresh channels, probably they would have gone under; but they had maintained their own successfully to the benefit of the public. It must be borne in mind that municipalities had the ratepayers at their

backs, and the whole security of the rates, and therefore it was possible for a municipal electrical undertaking to be carried on upon vastly different lines to a commercial undertaking in the hands of a company. It was thought in 1902, when the clause was first inserted in an Electric Lighting Order, and was known as the "Bermondsey" clause, that this was a solution of the difficulty. In the year 1903, it came before Parliament again, and was put into several Orders, including one for an extension to the Brighton supply area—the clause applying to the added area only. Sir John Snell would not even accept the clause in this form. Why, he could not understand, because the main objection seemed to be on the ground that it would interfere with power contracts, and it was not suggested that such contracts could be obtained in Bitterne. By the decisions in 1903, the gas industry thought it really had got the protection of Parliament; but in 1904 the matter came to a crisis. In that year there were two Bills relating to Leyton (Essex) and Swindon in which the House of Commons refused to insert the clause; but the House of Lords insisted, and the clause went in both Bills. It also went into eleven Provisional Orders. Therefore in 1904 Parliament had made it clear that the practice was to be uniform. But it did not stop there, for in 1905 there were a number of Orders in which the clause was inserted, either by agreement or by Parliament, because the Board of Trade were refusing to insert the clause at the time. In 1907, gas companies came to Parliament again and again and secured this protection; and in the year 1908 came the Llansamlet Order. By this time the Board of Trade were apparently convinced that Parliament intended that the clause should go in; and from that time until now, the Board had inserted the clause in all Orders where it was asked for by gas companies. The first exception was the present Order. It had been said that the clause should not be inserted because the Southampton undertaking was in a flourishing state. But was it not because, as late as 1904, some members of the Corporation were not satisfied with the policy of the undertaking that Sir John Snell was called in to report? In this report Sir John recommended a depreciation and renewals fund, and pointed out that too much was being charged for current for tramways and too little for public lighting. He also stated that there was no real reason for reducing the charge for private lighting from 3½d. to 3d. per unit. Why, then, was the reduction made? The report showed that the concern had not been carried on upon the best lines. Reference had been made to the Pirelli contract. But this did not contain a coal clause, and Sir John Snell did not approve of it. It meant that the price to be paid to the Corporation was a fixed one whatever the cost of coal. He regarded this as an improvident contract; and gas companies invariably in making such long contracts provided that the price should slide in proportion to the cost of coal. The Corporation had not only made the mistakes mentioned in Sir John Snell's report, but, in embarking upon the power business, had perpetrated an initial blunder which made it very necessary for the Gas Company to get the protection which had been given by Parliament so uniformly hitherto. As to the demand in Bitterne, no one had been called from the district to say a supply was wanted; and he suggested that the Gas Company were entitled to protection in one of three ways—by the application of the Northumberland clause to the whole of the electrical undertaking, or to Bitterne only, or to the whole of the undertaking, with the proviso that it should not apply to large power contracts.

The CHAIRMAN, at the close of Counsel's speech, said he had sent for a representative of the Board, of Trade, in order to ascertain why the clause had been refused in this instance.

Mr. M. J. COLLINS of the Board of Trade subsequently attended.

The CHAIRMAN: What are the reasons which actuated the Board of Trade in this case?

Mr. COLLINS: Since 1904 the Board have decided to insert the clause in every Provisional Order granted to a local authority where the clause was asked for by an opponent, except in exceptional cases where the Board thought the clause unnecessary. We insert it in all cases, but keep it to ourselves not to insert it if we think there is no necessity for it. I think we have inserted it in every case since 1904 except in the present case. We had a meeting at the Board of Trade between the promoters and the Gas Company. It was represented to us that the promoters would only spend £400 on the work; and as the profits of the undertaking for several years had amounted to thousands of pounds, it appeared to us that the whole undertaking could not be a sufficient loss to have to come on the rates for assistance. Even if the £400 were expended, and not one consumer was obtained, it would not affect the revenue; and we thought it rather absurd to put it in.

Was not the clause inserted as much for the protection of the gas companies as for the ratepayers?—Gas companies usually ask for the clause, except in one case in a South Wales mining district, where a mining company who were very large ratepayers asked for it.

Was not that for their protection?—Yes, to prevent the undertaking becoming a bnrden on the rates. In the Southampton case, however, we thought it would be impossible for it to be a burden on the rates owing to the small amount of capital expenditure.

You do not take into consideration any other point except so far as it should be a burden on the rates?—Yes.

That is the only point you take into account?—The only other point is competition. But we never take this into consideration, because gas companies invariably oppose electrical undertakings.

Have you considered whether the clause should be applicable to the whole undertaking or to the extended area only? I understand that when the Order is drawn it provides that the existing concern and the extended area are regarded as one undertaking.—The new Order and the old Orders are to be read together. It would be very difficult for the existing undertaking and the extended area to be kept separate.

The CHAIRMAN: There are cases of that sort?

Mr. VESEY KNOX: Brighton, I think, is the only case. There is Wimbledon in regard to the Maldens and Coombe. In that case the clause applies to the extended area, but only in the event of the Maldens District Council purchasing the undertaking from Wimbledon.

The room was then cleared.

The CHAIRMAN, on readmission of the parties, said: The Committee have decided that the Order should be confirmed, but that the Northumberland clause should be applied to the extended area only.

## ASHINGTON URBAN COUNCIL BILL.

Consideration of this Bill [a report of the earlier proceedings in which was given in the "JOURNAL" last week on p. 85] was resumed last Tuesday. An adjournment had taken place in order that the Ashington Council might consider an offer from the Tynemouth Corporation for a supply of water in bulk, or, alternatively, for Tynemouth to take over the supply in Ashington and include it in the Tynemouth water limits.

Mr. BALFOUR BROWNE, K.C., for the Tynemouth Corporation, read certain correspondence which had taken place between the parties dnring the adjournment, the outcome of which was that the Ashington Council preferred that the Tynemouth Corporation should include Ashington in the Tynemouth water limits.

Mr. HONORATUS LLOYD, K.C., for the Ashington Council, said that, although the authority would infinitely prefer their own scheme, nevertheless, having regard to the Chairman's remarks, he had advised his clients to adopt a course which he believed it was his duty to do; and they had reluctantly agreed to accept the offer of the Tynemouth Corporation to supply in Ashington on the same terms and conditions as in Tynemouth.

Clauses were subsequently brought up to give effect to this agreement. The Tynemouth Corporation are to bring a Bill in the next available session of Parliament for powers to include Ashington in its water area; and if within one year of the passing of the Act the Corporation have not substantially commenced the works, or within three years are not able to supply, then the Ashington Council are to be free to go ahead with their own scheme, which is provided for in the present Bill. A reservoir with an initial capacity of 1,000,000 gallons is to be provided—this capacity to be increased to 2,000,000 gallons when the average daily consumption exceeds 400,000 gallons. It is further provided that Ashington shall not be liable for any rate-in-aid that the Tynemouth undertaking (including Ashington) may involve; and the Tynemouth Corporation are to purchase the existing mains, pipes, &c., in Ashington, and take over all obligations, other than the present debts and liabilities, of the Ashington Council in regard to the existing water undertaking.

The CHAIRMAN, at the conclusion of the proceedings, remarked that it was the feeling of the Committee that Ashington should have the favourable terms they had obtained having regard to their giving up their own scheme.

The Bill was then reported for third reading.

## WEARDALE AND CONSETT WATER BILL.

This Bill was disposed of last Thursday by a House of Lords Committee presided over by Viscount BRISTOL. It has already passed the House of Commons. [See "JOURNAL," May 25, p. 462.] As on the previous occasion, the hearing extended over several days.

The scheme of the Bill is to construct a new reservoir at Burnhope, and to take water from certain springs until the reservoir is completed. An aqueduct 28 miles in length will be made. The opposition was, as before, from local authorities in the Consett area, who objected to the proposed increase of 10 per cent. in the charges, and asked that this should not apply to Consett. Further, it was urged that the Company should be put under greater compulsion than was placed upon them by the House of Commons, in order to ensure that the new reservoir is constructed.

The Committee, however, decided that Consett should not have preferential treatment in the matter of charges. With regard to the construction of the reservoir, it was decided that the new scale of charges could only come into operation after £120,000 had been spent upon commencing the works. From then until a further £200,000 have been spent, however, the Company must give a rebate of 10 per cent. off the scale. After this, the rebate will be reduced to 5 per cent. until the reservoir is finished, when the full increased scale will apply.

**Tipton Gas-Works Accounts.**—The statement of accounts relating to the gas undertaking of the Tipton Urban District Council, for the year ended March 31, which has been prepared by the Manager (Mr. William Prince), shows that the receipts amounted to £21,951, and the gross profit to £4873. This, after meeting interest and sinking-fund charges, was transformed into a net deficiency of £482, which has been carried to the accumulated profits account. The quantity of gas made was 153,316,000 cubic feet, compared with 149,163,000 cubic feet the previous year; and the net coal gas made per ton, 12,204 cubic feet, against 11,356 feet. Leakage, condensation, &c., figures at 11·08 per cent., compared with 9 per cent.

**The British Coalite Company.**—From the "Liverpool Courier:" "There are numerous concerns, hitherto in very low water, which have reason to bless the war for giving them a chance to recover their footing. One of these is the British Coalite Company, whose shares at the beginning of the present year went begging at 1s. apiece, but now cannot be bought under 12s. Not only has the issue of capital required for the formation of the subsidiary Company—the Barnsley Smokeless Fuel Company—been sanctioned by the Treasury, but it is said that the Government have taken an interest in the Company, and have entered into a contract for the purchase of the entire production of certain of the bye-products. The low-temperature process produces benzol, the spirit which is converted into motor spirit; while the residual toluol is one of the chief products used in the manufacture of high explosives. The first unit of the plant, to treat 50 tons of coal a day, is expected to commence working early in November; and eventually the plant is to be increased to a capacity of 200 tons of coal a day. The further progress of the enterprise will be watched with the deepest interest at the present juncture."

# LEGAL INTELLIGENCE.

## CHARGE AGAINST A GAS COLLECTOR.

At the Salisbury City Petty Sessions, William Lucas, formerly slot-meter collector in the employ of the Salisbury Gas Company, was charged with embezzling several sums of money. It was stated that until January last he was collecting practically by himself, with a little assistance now and then when he asked for it, from the whole of the slot-meters in the city, which numbered about 3000. After that time he had assistance given him; but the other collectors merely accounted to him for what they received, and not to the Company. The night before he made a collection he went to the Company's office and took certain sheets which referred to the particular meters he was going to collect from. On these sheets, after he made the collection himself, he would put the date of the collection, the index, then the amount shown on the meter, and also the actual consumption since the last collection. The sheets never went into the possession of any other sub-collectors; and the sub-collectors only received from the defendant slips of paper with the numbers of the houses to which they had to go. On the slips they filled in the amount they collected from the slot-meters in the houses, and the amount shown on the meter. The sub-collectors had no knowledge whatever as to whether what they collected was the proper amount according to consumption, because they did not know what the consumption was. The collectors never had, as far as they could remember, any complaint from the defendant—who checked their money when they brought it in—that he had not received enough. Recently officials of the Company came to the conclusion that the collections were not being carried out properly, and that there were arrears of work; and they announced to Lucas their intention of employing another collector in addition to himself, who would also take out sheets and be responsible to the Company for the amounts he collected. This new man was to be an assistant collector, and not a sub-collector. When the defendant heard of this, he went away; and since then several letters had been written by him. The first of the letters was received by Mr. Norton H. Humphrys (the Manager), and in it defendant said: "I have saved my wife and my child's life by doing wrong. I must have spent hundreds of pounds on their lives, and my little son who died, and six before him." It was found that collections had been made from certain houses, and the money paid to defendant, who had never handed it to the Company. Lucas had been in the employ of the Company for 25 years. At the time he went away he had in his possession 250 of the Company's sheets, which after he left were found in his bag, with certain money. The 250 sheets showed that a collection made with the various sub-collectors just before the defendant went away resulted in about £20; but the sheets actually showed that the consumption since the last taking was 729,200 cubic feet. This, at its cheapest rate of 3s. 9d. per 1000 cubic feet, came to about £136. One charge only was gone into before the Bench, and to this [which related to the embezzlement of 7s.] defendant pleaded guilty. He was sent to prison for two months, without the option of a fine.

## Ilkeston Council Troubles.

At the Ilkeston Petty Sessions last Thursday, Mr. William Smith, a member of the local Town Council, summoned Mr. William C. Coxall, the Borough Accountant, for "obstructing him as a burgess and a person authorized to inspect the water services and charges book." For the prosecution, Mr. Ellison quoted the Municipal Corporations Act, which said that the treasurer's accounts shall be open to the inspection of the council; and if a person having the custody of any such document obstructs a person authorized to inspect them, he shall be liable to a fine not exceeding £5. The particular accounts related to water supplied by the Ilkeston Corporation. In consequence of complaints received by Mr. Smith, with reference to certain ratepayers having been overcharged for water, he went to the Borough Accountant's office to inspect the register of water charges, which was handed to him by the clerk in the water office. While he was inspecting the books, the Borough Accountant entered and snatched a book away from him. Mr. Smith then consulted the Town Clerk as to whether the Borough Accountant was within his right in refusing to allow him to see the books; and the Town Clerk replied he was not prepared to give an off-hand opinion. Shortly afterwards a ratepayer was found to have been overcharged to the amount of £1 5s. 3d.; and the latter received a letter from the Borough Accountant stating that, "on investigation," he found he had been overcharged, and in due course a cheque for £1 5s. 3d. would be forwarded. This showed the motive of Mr. Coxall in disputing the Statute. It also showed the necessity and duty of members of the Council to investigate these matters for themselves and not to take the word of an official, because all officials were liable to make mistakes. A long legal argument ensued. After the water charges register had been produced, Mr. Huntsman (for the defendant) argued that it was in no sense an account book. He also contended that the summons had been wrongly issued under the Municipal Corporations Act. The powers of any public authority in these matters were contained either in the Public Health Act or the Water-Works Clauses Act—not the Municipal Corporations Act. The Chairman declared the Bench were unanimously of opinion that under the Municipal Corporations Act, 1882, the case failed. They were, however, strongly of opinion that the ratebook ought to contain the particulars, so that every ratepayer could see how, and for what, he was charged. There should be some evidence that members of the Council and burgesses could go and receive strict courtesy, and have all the information they required. An application for costs was refused.

Provisional notice has been given by the Directors of the Kirkham (near Blackpool) Gas Company of their intention to raise the price of gas from 3s. 8d. to 4s. per 1000 cubic feet.

# MISCELLANEOUS NEWS.

## A JUBILEE AT PAISLEY.

### Mr. G. R. Hislop's Fifty Years' Service.

Before proceeding to the ordinary business at their meeting last Tuesday, the members of the Paisley Town Council took part in a pleasing function—that of expressing to the Gas Engineer and Manager, Mr. G. R. Hislop, on the attainment of his jubilee, the Council's and the community's appreciation of his invaluable services, their congratulations that he has been spared to give fifty years of service, and their hope that he may yet be blessed with many happy days.

Provost ROBERTSON (who wore his chain of office, an indication, as he explained, that something unusual was to happen) said when it became known that Mr. Hislop was completing his 50th year in the service of the Corporation, the members of the Town Council felt that an occasion so unique should not be allowed to pass unnoticed; and it was unanimously agreed to present him with a token of appreciation of his services, and also of respect for him as a man. It fell to the lot of few men to spend fifty years in one service, and to few corporations to be served for fifty years as he had served them. Not only had Mr. Hislop served Paisley during all this time, but he had been rendering great service to his country as well. Being an enthusiast in the work, he was not content with gas making as he found it, but believed many improvements could be made in the manufacture. He applied his mind to the subject, and by research and study introduced many appliances and processes which had gone a very long way to cheapen production. At the present moment, he believed, Mr. Hislop was one of the highest—if not the highest—authority on gas production in the country. In the fifty years that had gone, Mr. Hislop had seen many Conveners, men of various types, temperament, and ability. These Conveners were supposed to assist him; but, as a past-Convener, he could state that no assistance was needed by Mr. Hislop. The easiest way for a Convener to run the department successfully was to leave the conduct of it entirely in Mr. Hislop's hands. [Laughter and applause.] Mr. Hislop invariably got his own way, and that way usually turned out right. On behalf of the Town Council of Paisley, on behalf also of the citizens whom they represented, he had to hand over to Mr. Hislop a silver tray, bearing the inscription:

> Presented by the Town Council of Paisley to George R. Hislop, Esq., C.E., F.C.S., on the attainment of his jubilee as Engineer and Manager of the Paisley Gas-Works, in token of high esteem and appreciation of long and faithful service.

Not only did it bear this, but it was inscribed with the signatures of the members of the Town Council and of the Town Clerk. It appeared to him a wonderful thing to see Mr. Hislop so active both in mind and body after fifty years of arduous work; and he wished to convey to him the assurance of the high regard in which he was held by the townspeople and the Town Council, and their high appreciation of the services he had rendered not only to them, but to the whole country. He hoped Mr. Hislop would be long spared to manage the gas-works. He believed the tray would find a prominent place in the recipient's house; and it would recall his long association with the Gas Department of the Corporation. These recollections, they hoped, would always be agreeable; for certainly Mr. Hislop's association with them had always been a happy relationship. [Applause.]

Mr. HISLOP (who was cordially received) acknowledged the handsome gift. He said his position was unusual in the experience of public servants; for he was the recipient of their kind sentiments and good wishes on the occasion of his jubilee. More than this, he had received a beautiful, tangible token of their esteem and appreciation; and he could hardly find language in which to express his thanks for all their kindness. He accepted the silver tray, bearing the signatures of all the members of the Council, with gratification. It would tell of the past long after he had ceased to look upon it. He had served under many worthy men, and it was interesting and impressive to recall them and their work. They had served their day in the municipal administration, and many had crossed the bourne, leaving him behind; and it had fallen to their successors in the Council now to act in the name of these old friends, as well as for themselves, in paying him such a splendid tribute. He had great pleasure in looking back upon the time when for five years he served the Gas Commissioners, as well as the forty-five years of his service with the Corporation. The only black spot in the latter period was the seven years, from the spring of 1900, when the gas tests reflected on his management. While the Corporation were paying for coal to produce 27-candle power gas, the tests returned the illumination as being 4 or 5 candles less. This represented a deficiency under his management of something like £6000 a year. It was a veritable brain-rack, until he succeeded in demonstrating the fallacy. It hurt him so much that he many times thought of giving up the management. There had been a few narrow escapes from bidding good-bye to Paisley. One was so far back as 1869, when the Glasgow Corporation took over the gas-works. He was specially requested to apply for the position, and got a good assurance of succeeding. The Paisley Board heard of it, and came to him very distressed, expressing the hope that he would not entertain the idea of leaving them. In view of this, and the fact that his elder brother expressed a desire to become a candidate for Glasgow, he withdrew in his favour. The final result rested between Mr. Foulis and his brother; and Mr. Foulis obtained the position. He had great pleasure in serving the Corporation, which was proved by the fact of his long years in Paisley. It had done very kindly by him; and the Conveners and Sub-Conveners who had been from time to time appointed had invariably proved very agreeable gentlemen, who offered him every encouragement in his work. The gentlemen occupying these offices now were typical of what he had said. In conclusion, he referred to a history of the gas undertaking which he had produced,*

* Reference is made to this history of the undertaking on another page.—ED. J.G.L.

sending a copy to each councillor. He pointed out that he had taken the liberty to dedicate it to the Provost, Magistrates, and Town Council. It would serve to keep in memory the names of many councillors who were identified with the development of the gas-works. They had left their footprints on the sands of time; and happy they should be if they sought to emulate many of them in their self-sacrifice and devotion to the work that lay to their hand. He thanked all very sincerely for their tangible and verbal appreciation of his fifty years' services. [Applause.]

Provost ROBERTSON, in acknowledging the receipt of a copy of the history prepared by Mr. Hislop, said it was a beautiful book worthy of a place in anyone's library.

Another gift, from the staff of the Paisley Corporation Gas Department, comprised a handsome silver calyx-shaped cup. The presentation was made by Mr. A. S. Nisbet (the Assistant Gas Manager).

## SOUTH SUBURBAN GAS COMPANY AND METER-RENTS.

### The Proposal Abandoned.

Recognizing the dissatisfaction generally expressed throughout the district at the proposed increase of meter-rents, the South Norwood Ratepayers' Association held a special meeting last Friday evening to consider the matter. There was a thoroughly representative attendance. The PRESIDENT (Rev. John Warner, Vicar of South Norwood) occupied the chair. Mr. Wilfrid Wastell, the Secretary of the South Suburban Gas Company, was present by invitation.

The PRESIDENT, in opening the meeting, said they had met to consider a question which was causing all there, and very many people outside the meeting, a great amount of—he would not say heart-burning, it had not got to that—dissatisfaction. When the Company's circular reached them, many regarded it as a bomb, the contents of it somewhat asphyxiated them. He was not giving anyone away when he said that, in his opinion, they would leave the meeting a great deal more satisfied than when they came into it. He had seen criticisms of the Company's circular in the "GAS JOURNAL." One argument used was that if the circular had been more definite, and not so very brief, there would have been less objection to it. He did want to say this, that if the circular had been more definite it would not have induced them to agree to the alteration of a charge for meters which hitherto had been considered fair. He quite agreed with the "GAS JOURNAL" in the view that this attempt of the Company to remove inequalities would lead to fresh inequalities. He was not an expert in these things, and had only the very slightest technical knowledge of the whole matter; but when he considered that the original cost of meters, whether large or small, was entirely wiped-out over and over again where they were in use year after year, it was no satisfaction to be told that the consumers were to be charged more in order that £1000 deficit occasioned by the upkeep of gas-meters should be wiped out. Then they had to consider another question. When alterations of this kind were proposed, they were bound to consider the opportuneness or inopportuneness of the procedure at the moment. He thought the present was the most inopportune time to seek to raise the rental of meters just double. Gas had advanced in price. He knew there was the trouble about coal; but this was common to them all. If coal was costing gas companies more, they knew, also, that the income from residuals had increased tremendously. They had to take into consideration that the circular could not have been the end of all things. It was a question of Are you willing? He thought Mr. Wastell would hear from the meeting, and certainly from him, that they in South Norwood were not willing. He, for one, would not sign the circular; and he heard the same on all sides. They could assure the Gas Company of their reasonableness, and of their fairness; but at the same time they assured them of their feeling of injustice that at the present moment the Company should seek to raise the rent of gas-meters. They asked the Company, very conciliatorily, but very firmly, to reconsider their decision. He would like the meeting to hear Mr. Wastell.

#### THE GAS COMPANY WITHDRAW THE CIRCULAR.

Mr. WASTELL thanked the Association for giving him the opportunity of coming there and explaining the matter, which was one of grave concern to the Company, as it was to the residents. He felt as though he was a champion without a cause, because the Directors at an ordinary meeting that afternoon, when the matter came up for consideration after a fortnight's experience of the issue of the circular, had decided to let the matter drop. [Applause.] But he thought it was only fair to the Company that he should give the Directors' point of view, so that the members of the Association might go away with a clear idea of how the position stood. One thing which had troubled him in the correspondence and criticizing arising out of the circular was the one-sided view that many people had taken. There was an old saying that every question had two sides; he thought this question had 200. The one side which appealed to the Directors first was that in these times they, as a public company charged with a public service, must see that they performed this service, not only in the interests of the shareholders but also in the interests of the consumers. He would tell them one fact first of all. The charge of 3s. for meters was fixed a great many years ago. They had searched back to 1868, and it was made even in those days. Was it reasonable to expect a charge made nearly 50 years ago to go on in perpetuity regardless of all circumstances? The Company had to look at the matter from their own side first, and from the consumers' side next, or should he say, both these sides together. The Company found that, owing to the changes arising, the charge of 3s. was not sufficient to meet the charges on meters. The capital debit on meters was to-day not very far short of £100,000. This money had had to be borrowed, was spent, and the Company had to pay 5 per cent. upon it. The cost of repairs to meters and maintaining them was last year between £7000 and £8000. Taking the interest on capital, apart from the sinking fund and the cost of maintaining the meters, the Company had to meet an outlay of between £12,000 and £13,000. The universal principle in this district was to charge for meters. The meter charge then should be sufficient to recoup the outlay on meters. But it did not at present do so; and this was the difficulty they were faced with. There were two ways of dealing with it—one to continue the practice of a rent regardless of the size of meter, or else to adopt the general practice in these parts of a differentiating rate according to size. Looking at the matter from all possible points of view, the Directors decided that to introduce the differentiating system would have been to impose greater hardships on a greater number of consumers than would be the case by increasing the flat-rate. The "GAS JOURNAL," which the President had quoted as the official organ of the gas industry, had fallen into error in saying the Company were trying to introduce a flat-rate when they had hitherto had a differentiating rate. Other criticism of newspapers he would not deal with, as it was based on a misapprehension of facts. He did say this, taking the total figures, their income from meter-rents was not sufficient to meet the outgoings on meters. Meters were mechanisms which, like clocks, were prone to go wrong. There was not a meter fixed twenty years which had not had money spent on it. It was a mistake to suppose that a gas-meter once fixed was fixed for all time. The proof of this was in the annual cost of repairs. The Directors had had to meet another objection—namely, that the time for this increase was inopportune. To this he was inclined to agree. If they had raised the rent when gas was falling in price, or had left the matter for happier times, there might have been less criticism. But he thought he might safely say that at whatever time they proposed to the consumer to give his consent to a voluntary increased charge it was morally certain there would be some amount of criticism. No man in his senses would willingly agree to pay more than he had been paying, whether now in war time or in the piping times of peace. There was one thing all the newspapers had omitted to state, either wilfully or from a lack of knowledge. The remedy was in the hands of the consumer. If a consumer thought he could maintain a meter for less than the Company did, he could do so. The Company operated under an Act of Parliament which, while it imposed obligations on gas companies, also imposed obligations on consumers. Under the Gas Acts, while a company could refuse to supply gas unless it passed through a proper meter, the Acts could not compel the use of a company's meter. He should like to bring this fact home, that if any consumer thought he could do better by his own private meter he had the right. [A MEMBER: And the meter would be considered always wrong.] The accuracy of the meter was outside the jurisdiction of the Company—they had no right to challenge its accuracy. If the Company had an idea a meter was not right, then they asked that the County Council—the final court of appeal—should test it, and if it was found correct the Company paid the cost of testing; if incorrect, the consumer paid the cost. But none of the newspapers had pointed out the fact that a consumer could provide his own meter, and indeed had a statutory right to supply it, as the Company had the statutory right to decline to supply gas without a meter. He wanted them to feel that his Directors valued more than anything the friendly relations existing between the Company and the consumers right up to the present time. He believed that if only six consumers out of the thousands affected by this matter had firmly declined to agree to the new terms, the Directors would, rather than offend the six, have waited for a more opportune time, or have met the loss on the meters from some other direction.

#### REPLIES TO QUESTIONS.

In reply to questions, Mr. WASTELL said about 16,000 consumers were affected by the proposals. Of these, 5-light meters numbered between 5000 and 6000. The other consumers used meters of 10, 20, 30, 40, and 50 lights, and in any other district in London would have to pay much more than 6s. for such meters. If any one had any ground of complaint, it was the consumer with a 5-light meter. A 50-light meter cost £8. If they took the cost of providing the larger meters—fixing, maintaining, and testing periodically, added to the interest on capital—they would find was a rent of 6s. far behindhand. There were two propositions—to continue the flat-rate and increase the price, or to charge a differential rate according to the size of the meter. If they had done the latter, they would have adversely affected 10,000 consumers. It was this fact that induced the Directors to retain the old practice of charging a uniform rate rather than introduce a new principle of the differential rent. The value of the extra income to the Company would have been under ¼d. per 1000 cubic feet of gas. In order to make up the deficiency on the meters, the Directors did not think it would be fair to increase the cost of gas 1d., as this would have given them ¾d. per 1000 cubic feet, which the Directors did not want.

The PRESIDENT asked how much would the loss of the £1000 on meters decrease the dividends.

Mr. WASTELL replied it would not affect them. A newspaper article had stated that the 9d. increase on meter-rents represented 1¾d. per 1000 cubic feet to consumers of 5000 feet. This was right so far as it went; but he doubted whether they had any, or many, consumers, of so small a quantity. The Company did not want to put 1d. per 1000 cubic feet on gas to make up a deficiency on meters—they wanted meter-rents to meet meter expenses.

A hearty vote of thanks was passed to Mr. Wastell for his presence, and everyone left the meeting well satisfied.

**Restricted Lighting at Camberley.**—Subject to the question of responsibility in case of accidents to persons and vehicles, as well as of damage to the lamps, the Blackwater Gas Company have advised the Camberley Urban District Council that they would be prepared to make a reduction of 2s. 10d. for each street-lamp the Council might request them to keep unlighted during the months of June to September. Reporting on the matter at the meeting of the Council last week, the Highways Committee stated that they had instructed the Clerk to write to the Company pointing out the great discrepancy between the amount charged to the Council and the sum of 2s. 10d. per lamp offered. The Clerk reported that the Company had replied stating they were unable to increase the amount offered. General Dalrymple expressed regret that the Company were unable to take a more liberal view of the situation. The Council accepted the concession.

## THE DEPARTMENTAL COAL COMMITTEE.

### Concluding Notes from the Evidence.

Some reference was made on p. 86 of last week's issue of the "JOURNAL" to the evidence given by witnesses before the Committee appointed by the Board of Trade to "inquire into the causes of the present rise in the retail price of coal for domestic use." The remaining witnesses who appeared before the Committee at their various sittings [which were held in February and March last] are now similarly dealt with. The members of the Committee were: Mr. Vaughan Nash, C.V.O., C.B. (Chairman); Professor W. J. Ashley, Birmingham University; Mr. J. Boyton, M.P.; Mr. W. Crooks, Labour Member for Woolwich; Mr. J. J. Dent; Mr. A. W. Flux (Director of the Census of Production, Board of Trade); Mr. Stanley Machin; and Mr. James Rowlands, M.P.

Mr. *Arnold Tebbutt* explained what had been done in Winchester with regard to the supply of house coal. They had been told that the only way in which sufficient supplies could be got in would be on the understanding that every truck would be cleared within four or five hours of arrival; and the only means by which this could be done was by the merchants pooling their coal in one common heap, from which each subsequently drew his share. Of course, in this way the different qualities became mixed. One retail price had been fixed for the whole of this coal.

Mr. *E. W. Winch*, the Secretary of the Guinness Trust, gave evidence as to the special arrangements made for supplying coal to the tenants of the Trust's workmen's dwellings in London.

Mr. *Hamilton Greig*, the Managing-Director of Messrs. Cory and Sons, was the next witness, and he described first how retail prices are determined on the London Coal Exchange. Speaking as a wholesale merchant, he did not like the sliding-scale arrangement; but the collieries had taken to it, and some absolutely insisted upon it. At the moment London was excessively short of coal; and this was the cause of the whole trouble. The collieries were nearly all claiming 20 per cent. reduction on deliveries under contracts. As a rule, a colliery owner sold largely under contract, to make sure of his pits being worked regularly, and played with the balance to make his profit. With regard to the apportionment of the 9s. per ton increase in the price of coal, he would put 4s. 6d. to the coalowner, 1s. to truck hire, 2s. for the increased cost of distribution, and wages were about 4d. a ton extra.

The CHAIRMAN: That leaves a gap of about 1s. 2d. It looks as if it leaves a little bit in favour of the coal merchants. I thought your suggestion was that the coal merchant, on current prices, was not making anything?

*Witness:* On what he has to pay to the colliery for current supplies. I could do with 40,000 tons a week more coal in London alone, if I could only get steamers.

Mr. *Errington Brewis*, representing two amalgamated firms connected with the London coal trade, as well as the largest colliery in Leicestershire, gave information as to the trolley trade, which he said is declining. An advance in prices, he thought, on the whole, was purely a spontaneous action on the part of the coal merchants. The advance in prices in London worked out roughly at 10s. per ton. If there had been no sliding-scale at all in operation, it would have amounted to as much. The sliding-scale was a compromise, and a protection to both the vendor and the purchaser. Undoubtedly the profit, in the case of a great increase in price, went to the colliery. There was really no such thing as a "ring" or "combine." It was not possible to place a maximum selling price on the London coal merchant unless a maximum price could be placed on the producer—the colliery owner. If the conditions that existed now continued they were at the mercy of the colliery owners, and the country was at the mercy of the colliery owners. There was a strong combination of colliery owners who regulated selling prices, and who regulated matters relevant to the trade wages, and that sort of thing. He thought a maximum price could be fixed that would make every colliery owner eager to work his pits and make a handsome profit, and yet be 6s. per ton below present prices. The maximum need not be fixed for the duration of the war. It might be subject to revision, if evidence could be produced that it was necessary to revise it up or down. At 2s. 6d. or 3s. a ton over the ordinary current prices of the last three years, the coalowner would be left with an increased profit. If there was to be regulation of price, he would say the sooner the better. As a colliery owner, he was not in a position to execute all his contracts. He had taken off 20 per cent. of the contract quantity under the terms of the contract.

Dr. *John Cadman*, Professor in the Mining Department of the University of Birmingham, said he was Consulting Engineer to two collieries in the Midlands, with regard to which he quoted a number of statistics bearing on the price of coal. He stated that he had had to buy coal recently from a small dealer at a price which came out at almost 2s. per hundredweight. Trying to arrive at a reason for such a price, it seemed to him the man who was selling in a small way like this was buying through about four or five stages from the colliery—there were so many middlemen.

Mr. *Thomas Hutton* gave further evidence of the trolley trade in Poplar. He said that at the depôt from which he drew his coal there were three or four merchants; and he had to buy through them. It was a tied depôt to the merchants there. If he did not buy through these merchants, he could not get to the depôt, as the railway company would not accept him. Afterwards he had a better price offered to him outside by a colliery agent or factor; but he could not accept it. He was not able to go on the Coal Exchange and buy.

Mr. *A. M. Wright*, representing a colliery company having pits in Derbyshire and Nottinghamshire, remarked that so many of the men had gone that he had to reduce deliveries on contract by 10 per cent. The want of coal by water was affecting London enormously. He thought about 55 per cent. of the coal which came to London was water-borne; and a good deal of this was household coal. He had not been in the position of feeling himself unable to supply the whole of the quantity contracted for, and then selling the same merchant from the free coal certain amounts at current prices.

Professor ASHLEY: But however it is brought to you, it is the case that at the very time you are informing the merchants that unfortunately you will not be able to give them the whole of their contract quantity, you are still selling coal at current prices?

*Witness:* No; I do not think so. Not the same coal.

Mr. MACHIN: I take it you would not feel at liberty to sell your surplus coal (say, 15 per cent.), until your contracts had been completed?

*Witness:* Certainly not. Contracts must come first, and always have done.

Mr. CROOKS: Did the notice that you could not supply up to the contract quantity to the extent of 10 per cent. represent the falling off of the output? It did not leave you a greater free margin for sale?

*Witness:* No.

Now, 9s. per ton is an abnormal rise in two months?—It is only the public clamouring for the coal, and not being able to get it.

Sir *Richard Redmayne*, K.C.B., Chief Inspector of Mines, asked to give a rough idea of the number of miners who had enlisted, replied between 130,000 and 140,000. Over the whole of England, the figure would be from 10 to 12 per cent. Speaking generally, he did not think the working cost of coal due to the war had gone up to anything like the figure that people imagined. Unless there were some extraordinarily peculiar conditions, he would regard 1s. per ton for the increased cost of working the coal as a preposterously high figure.

The CHAIRMAN: I suppose things are in such a condition that it would be rather dangerous to propose that any inroad should be made on coal ordinarily used for industrial purposes to enlarge the domestic supply. The industrial coal and domestic coal both appear to be short. Is that borne out by your experience?

*Witness:* Yes; I think they have great difficulty in some parts of the country in fulfilling their contracts for both classes.

Replying to further questions, witness said he thought one must differentiate between the rise in the price of coal in London and that occurring elsewhere. The rise in London was a very fictitious one. To some extent it was warranted, and to some extent it was not. The fixing of a maximum price for coal at the pit-head would be possible, but it would be difficult. He did not think the miner was slacking when he was at work; but he was taking holiday very often. Something over 500,000 tons—after allowing for falling off in export and bunker coal trade—was the actual month's shortage of supplies compared with normal times on the basis of January.

Mr. *George Rose* explained that he was connected with a firm of coal factors, who supplied coal merchants, large consumers, electric light works, railway companies, and municipal bodies, on a wholesale basis. He was also a director of a retail firm, and in this capacity could say that there was no real controlling body which regulated the price of coal on the London Coal Exchange. It was generally a matter of discussion between the leading merchants. Probably there was no business in London where the competition was so keen as in the coal trade. In a general way, he could not consider present prices in London were in any way extravagant, having regard to the circumstances. Collieries were asking him to accept diminished amounts on contracts, and at the same time were supplying free coal. The matter would probably come before the Courts. The item of waggon hire came largely into the increased price. At the moment the question of transport was far and away the most important point of the whole situation.

Mr. *S. Allen* and Mr. *J. Burgess*, managers respectively of the coal departments of the Co-operative Wholesale Societies in Manchester and London, then gave evidence as to the methods of working adopted, and prices. A case was cited of a particular colliery that had knocked 20 per cent. off contract deliveries. They actually, however, supplied 140 per cent., and charged an excess price on 60 per cent. In another case, 75 per cent. of the coal under contract was supplied. But instead of 416 tons a month, 716 tons were supplied; and extra was charged on 400 tons.

Lieut.-Colonel *A. Leslie*, the Organizing Secretary of the Admiralty Coasting Trade Office, told the Committee that this organization was designed to bring into use certain interned enemy vessels primarily for the relief of the coal trade of London. There were 25 of these steamers which had been running for a fortnight, and had carried something like 130,000 tons. The coal carried was for public utility companies and institutions as far as possible. The freights were governed by the market rates. The highest they had done was 13s. per ton. Two managers had been appointed at Newcastle; and they acted in exactly the same way as agents for ship-owning companies. The ships were a mixed lot; and the managers made as good a business bargain as possible with them. They were, however, instructed not to force up rates. They had always been, day for day, a little below the market rates. The consumer had got relief from these interned ships to the extent of the coal which had come in. He did not agree that, as far as cheapening the coal was concerned, the dealing with interned ships was an absolute failure. The idea was to send tonnage where it was most needed.

The CHAIRMAN: The domestic supply of coal really comes in through the gas-works—at least, that is our view—because the poor man, instead of using coal, now uses gas for cooking, heating, and everything else. So to all intents and purposes the domestic supply of London largely comes through the gas-works?

*Witness:* It is used in the form of gas very largely. But there is an enormous domestic consumption also; and you can only really deal with this, I take it, from the practical point of view on the railways, because the railway depôts of London are the distributing centres for domestic coal.

Proceeding, witness explained that the Over-Seas Prize Committee dealt with the interned steamers, and also the prize steamers; and the Admiralty Coasting Trade Office was an offshoot to deal with the former. The London Coal Advisory Committee was brought about with a view to try to find out the position of the various public utility companies as regarded their sources of supply, stocks, and consumption, and also to endeavour to work in such a manner that any one of

the companies finding themselves getting very much into a hole for supplies of coal would be able to get, through the Committee, a recommendation for priority of service.

Mr. *J. M. Eddy*, Mineral Traffic Manager of the London and North-Western Railway, was examined at considerable length as to transit and waggon arrangements. He claimed that coal had been brought to London as rapidly as the people who were to deliver it could do so, or even more rapidly. Generally, his conclusion was that the cause of the great increase in retail prices was that there was less output at the collieries. There had been some difficulty at collieries from want of railway waggons.

Mr. *H. L. Symonds*, Chairman of the Manufacturers' Section of the London Chamber of Commerce, said he had circularized 128 firms who were believed to be users of coal for manufacturing purposes. To the question, "Have you experienced difficulties in getting the usual supply of coal?" there were 54 answers in the affirmative, and seven in the negative. The second question was, "Have you been seriously prejudiced in your trade by the difficulty of obtaining coal supplies, owing, firstly, to increased prices, and, secondly, to delays in delivery?" To the first part of the question there were 43 answers in the affirmative, and to the second part 42; the answers in the negative being 13 and 14 respectively. Broadly speaking, those who said they were not seriously prejudiced appeared to be the smaller firms. Another question was, "Have you had any difficulty in obtaining coke or other fuel for the purposes of your business?" The answers were 31 in the affirmative, and 17 in the negative. The next question was, "Have you found it possible to extend the use of alternative sources of power—for example, gas and electricity?" Eight firms had been able to do so, and 35 had not.

Mr. *W. H. Hewlett*, Director and General Manager of the Wigan Coal and Iron Company, and Chairman of the Lancashire and Cheshire Coal Sales Association, said the latter body was an organization of coalowners. Lately the functions, as regarded the regulating of prices, had been rather of a restraining character. The Association did not regulate the pit-head price, but the price absolutely to the consumer. Lancashire supplied a good deal more coal direct to the consumer than did the ordinary type of collieries. If it had not been for the deliberations of the Association, he was certain prices would have gone much higher. He would say that 1s. per ton as the increased cost of working the pits was nearer the mark than 2d. or 3d. He thought the railways had done what they could. The retail price in Lancashire had only been advanced 10d. per ton.

Mr. *Roslyn Holiday* next gave evidence as to the West Yorkshire district. The principal cause of the reduced output, he said, was absenteeism—for what reason, he could not say. The Company of which he was Manager had adhered absolutely to their contracts. They, with a good number of other collieries, had abandoned the sliding-scale. The cost of getting coal had increased very much. He would put the figure for the colliery with which he was connected at from 1s. 3d. to 1s. 6d. per ton. It was not the fact that the market price rose or fell largely from day to day because of pit-head prices. It was the pit-head prices that rose and fell with the market price.

Mr. *William Johnson*, M.P., the Miners' Agent for Warwickshire, said the men were working practically full time when they could get the waggons. The collieries had done their best; but they found they could not keep the men going. The recruiting figure in Warwickshire was something like 20 per cent. He did not think it was the smaller number of men in Warwickshire that had caused the falling off in output, but the shortage of waggons. They could, he believed, have produced 10 to 15 per cent. more coal, if they had had the waggons.

Mr. *W. G. Phillips*, representing a Warwickshire colliery, stated that the output of coal in the county had been very seriously affected by the war—principally owing to the shortage of men, due to enlistment, and to an appreciable extent to the congestion of railway traffic, causing a shortage of trucks. The best quality coal had gone up from something like 16s. a ton to about 20s. a ton at the pit. They did not sell under sliding scale contracts in Warwickshire. It might be taken generally that in this county they had given notice to take 20 per cent. off the contracts. With this 20 per cent. reduction, there would not be more than 40 per cent. of free coal. There was no Association in Warwickshire to deal with prices. The owners acted individually. That London was rather useful as a dumping-ground, was an excellent description of the market.

Professor ASHLEY: You would say that in this national emergency, the coalowners claim to retain the usual quantity of free coal?

*Witness:* Practically that.

Mr. CROOKS: Do you think the war shortage of trucks and men would justify an increase of from 10s. to 12s. per ton to the consumer?

*Witness:* I would rather not answer that question.

Mr. *Arthur Westlake*, representing the Staveley Coal and Iron Company, gave evidence as to the position of affairs in Derbyshire. His Company, he said, did about 90 per cent. of their trade under contract; and they were approximately delivering their contracts in full. Personally, his inclination was to sell always at fixed prices; but there was competition to meet, and they gave their customers the option of buying in which way they chose. The increased cost of getting coal since the war began, he would put at about 1s. per ton. There were various bodies which would probably be called selling associations. They were all local organizations, and met to confer about prices; but he would not like it to be supposed that these associations were in any way "rings." They were not strong enough. There was nothing unusual about the procedure, and no mystery. The loss of output had been the most important cause leading to high prices; and he attributed a good deal to panic buying, first on the part of the general public, and then on the part of the merchants. He would not on any account sell on the sliding-scale next year.

Mr. *C. Hipwood* and Mr. *H. P. Everett*, of the Marine Department of the Board of Trade, gave evidence as to the use of the interned vessels for coal carrying. The policy, it was stated, had been to keep somewhere near the existing market rate of freights, but to keep below it. The object of this policy was no doubt to lead the market in a downward direction. The interned ships seemed to have had a considerable effect in reducing the freights. Many of the interned ships were large boats, and could not be used in the London trade. It would be extremely difficult, with other ports and services clamouring for freights, to put preferential terms at the disposal of the London utility companies. The first difficulty would be that of discriminating between the very numerous and pressing applications there would be for tonnage at specially low rates; and the second, that of securing that the benefit should go to the consumer, and not be intercepted on its way. In the case of the gas companies, with their sliding-scale arrangement, if they took full cargoes and they were the only people concerned, there would be no difficulty at all. One could give them boats at simply the cost of running them, because practically the whole of the benefits would go straight to the gas consumer. If the gas companies had been the only people who had to be considered, it would have been a much easier problem to deal with. If a practical solution of the difficulty could be found, no doubt it would be considered. Looking at the gas companies' case as it had been put by Mr. Milne Watson, it appeared absolutely unanswerable, taken by itself. Vessels belonging to the companies had been commandeered. They were badly hit; but the ordinary shipowner was hit in exactly the same way. A shipowner might not have direct customers in the same way as a gas company had; but he had indirect customers, who had to suffer. Freights had dropped very rapidly during the last ten days, to 8s. per ton [March 23].

Mr. CROOKS: Would you be surprised to know that in no place in the country, so far as we can discover, has the price of coal gone up as it has done in London; and the fact of your keeping the freights where they are has rather accentuated the difficulty than otherwise? We actually howled from the house-tops that the moment we got these interned ships, down would come the price of coal; and we found that the first thing we did was that we charged 13s., because the market had charged this rate, and the very people who were fleecing the public were encouraged to do so by the Government.

Mr. *Hipwood:* That is one way of putting it.

Mr. CROOKS: It is the man-in-the-street's opinion; and it is certainly mine.

This concluded the evidence taken by the Committee.

## CO-PARTNERSHIP IN CHEMICAL INDUSTRIES.

### Sir William Lever's Address to the Society of Chemical Industry.

At the Annual General Meeting of the Society of Chemical Industry, held in the Manchester School of Technology last Wednesday, an address was delivered by Sir WILLIAM LEVER, Bart., M.P., of Port Sunlight, dealing with the subject of "Co-Partnership in Chemical Industries."

Professor HENDERSON presided, and expressed regret at Sir William Lever's inability to be present. He had, however, sent a very good substitute in his son, Mr. Hulme Lever, whom he would ask to read the paper.

The author prefaced his remarks by stating they had become accustomed to hear it stated on public platforms and in the public Press that the British had allowed the Germans to acquire the lead in the fields of chemical industry. When they examined these claims they found that it was not because the Germans had originated more inventions, or made more important discoveries than either the British or the French. On the contrary, they found that the initial genius of inspiration had not been of German origin, and that whatever advantages the Germans might have acquired had been accomplished by their better industrial organization, and the better financial support given by their banking institutions and by the Government. The war had given us our awakening. Our industries would be stimulated to organize efficiently as a direct result of the war; but they should not fall into the common error, prevalent to-day all over the world, that the only thought they need give was to the attainment of efficiency in mechanical appliances, in chemical knowledge, and in banking arrangements. These must all receive the fullest consideration; and there would only be one disaster worse than neglect of these essentials, and that would be the neglect of the human element, without proper consideration of which our industries could not be efficiently carried on.

#### THE HUMAN ELEMENT.

After a reference to the problem of the human machine, and the variable nature of it, Sir William said that when they were dealing with chemicals they knew exactly how they would act and re-act under given conditions. If they could be equally certain of the effects of various methods of dealing with the human machine, the problem would not be a difficult one. There was no combination of forces or chemicals so delicate and intricate as the mind and body of the human machine, and for this reason—that no two human minds and bodies were alike.

#### APPLICABILITY TO THE CHEMICAL INDUSTRY.

Sir William Lever said his contention was that the larger the industry, and the more complex its organization, the less it was possible for the Board of Directors or the supreme management to know personally of the individual characteristics of the employees engaged under their direction. Therefore it had become essential that there should be some co-partnership system introduced into our industries. He knew of no industry to which this applied with greater force than to the chemical industry. A British chemical industry, founded upon the principles of co-partnership, with employees trained and instructed as to what these co-partnership principles meant, and realizing the opportunities co-partnership offered them, would surely possess employees superior to those of competitors in Germany, or elsewhere, under mere wage and salary conditions.

It was more difficult in the chemical industry than in any other industry to assess the services of each member of the staff, whether as inventor, developer of the inventions of others, or organizer, or rank and file employee carrying on the routine process of production. They all of them found an increasing difficulty in gauging the results financially of new developments in chemical industries. Some of the greatest disappointments they had had in their businesses had followed upon the greatest prospects of success. It only wanted a chemical process to be delayed in the realization of full success for losses instead of profits to result. Sometimes the smallest and the most insignificant means of

development had produced the most profitable results; and often the most costly experiments had produced nothing but losses. It must, and could only, be viewed as a whole; and the success of the industry could only be gauged by the success of all its parts. It was an absolute essential to success in the chemical industry that new and costly experiments should be made, and for expensive plant to be installed which might afterwards have to be scrapped. It would not produce that spirit of comradeship and feeling of fairness to discriminate in giving a fixed share of the profits between the various members of the staff engaged in the several departments of these new experimental developments. It was always possible, by means of salary, to make special recognition to the possessor of special abilities for the solution of difficult problems. Yet the possessor of these superior abilities might fail in the solution of some difficult problem; while another, possessing inferior knowledge and inferior ability, might succeed with an entirely different, and what might prove an easier, problem to bring to a profit-earning successful conclusion. These adjustments of abilities could best be made in salaries; but the broad success of the undertaking to which the unsuccessful experiment might have equally contributed with the successful experiment, because that ground had to be covered, as men had to cover mountains in search for gold, and could not discover gold without many borings without results—the broad success of the business could only be recognized, so far as the employees were concerned, on a system of co-partnership. He could not help but think that, working on these lines, the whole staff in the chemical industry, as in all other industries, would respond. He had the utmost faith in human nature, and believed that it could be trusted and depended upon nine hundred and ninety-nine times out of a thousand to respond to fair, just, and proper treatment. Often when they were disappointed with effects produced by co-partnership on employees, if they searched a little deeper they found that they had overlooked some point or other in their arrangements which had prevented the best results being obtained. In other words, to use a chemical parallel, their temperatures might have been wrong, or the catalyst might have been poisoned; and not until they discovered the right temperature and prevented the poisoning of their catalyst would the system succeed as it should do. Equally so, as they were in the very infancy of the study of co-partnership and profit sharing with employees, it might be that they had not yet got all the details correct, without which the transmutation from a lower value to a higher value could not be achieved.

### Rules for Present-Day Co-Partnership Schemes.

1.—Profit sharing or co-partnership must not degenerate into charity or philanthropy.
2.—Its objects must be the increased success of the undertaking, with increased prosperity for all connected with it.
3.—It must not place management in the position of servant to labour through liability to criticism and censure.
4.—It must ensure to labour freedom from interference of management in the enjoyment of the benefits derived from profit sharing.
5.—It must possess greater stability than a mere system of bonus cash payment.
6.—Its benefits must be felt by the wives.
7.—It must have a distinctly elevating tendency on management and labour, raising them in the social and intellectual scale, and increasing their power for enjoyment and happiness as well as their power of usefulness.
8.—Control must remain with those who find the cash capital.

### Gains of Co-Partnership.

Only by a system of co partnership, or profit sharing, could payment in addition to salary or wages be given. For not only was it true that wages were paid out of the product of labour, but profits must also come out of the product of labour, whether that labour was the brain and managing power of the directors and managers or the skill and labour of the workmen. The gain to the industries of the country by the adoption of co-partnership or profit sharing would not be confined solely to the stimulating of the direct personal interest of the employees. There would be another gain, which would be the release of the directors and managers to devote more of their time, freed from minor details, to the consideration of larger problems requiring attention and solution. The present salary and wage system might bind in fetters the employee; but it was only another illustration of the truth of the old Egyptian saying: "The chain that binds the captive holds the captor." By giving a direct personal interest to the employee, less personal supervision would be required from the employer, and the employer would be freed from the fetters that tied him down to close supervision of the employee. Partners were worth more than wage drawers; and when each employee, in proportion to his ability to affect the result, had become interested in the joint product of brain and muscle, they would then have reached a solid basis for the chemical industry, as for all other industries. By freeing labour to participate in the products of its own industry, they would liberate capital and management simultaneously for the enjoyment of a broader, a higher, and a more useful life.

## DISCUSSION.

Sir William Ramsay, K.C.B., F.R.S., who opened the discussion, observed that he had had experience of three systems of employment under different authorities. Shortly put, however, the best system of all was the "double system" advocated by Sir William Lever, whereby the man received a fixed salary *plus* a share in the profits. It was very difficult to analyze motives; but as one who had spent a considerable time under three methods of payment, he had no hesitation in deciding in favour of the one mentioned by the author.

Mr. Walter F. Reid (Addlestone) expressed agreement with the principles enunciated in the paper. Under the present industrial conditions it was not, however, possible for everyone to introduce such a scheme. He was bound to say that many employees looked upon a master's motives with suspicion. He had tried to introduce the payment-by-results system, in addition to the ordinary wages which the local Trade Unions insisted upon. This method gave a man a better chance of improving his position in a modern factory. He had met with workmen who did not thoroughly appreciate the advantages which they were deriving from such systems. On the other hand, he had found it an advantage to give a workman who did something out of the ordinary groove a bonus for himself. By this method the employee was encouraged, and gave the best he could. Some employers, he was sorry to say, did not thoroughly appreciate a workman's suggestions nor adequately reward him if he suggested certain improvements. He thought they should establish it as a regular principle that if a workman suggested a workable and profitable idea he should be rewarded for it. It was not given to every commercial man to be able to introduce the methods prevailing at Sir William Lever's factories. The conditions of modern industry did not make it possible for general procedure on the lines laid down by the author; but whether or not it was possible to do so, he heartily agreed that it ought to be done, because it benefited both the employer and the workman.

Professor Henry Louis (Newcastle-on-Tyne) said he was in favour of the scheme advocated by Sir William Lever. One could quite see that the future of British industry lay in the hands of the workmen. It was all very well to talk of improved machinery and of kindred subjects; but unless the workmen co-operated thoroughly the future outlook for our industries appeared very gloomy indeed. He was convinced that until they got a more enlightened attitude on the part of workmen they were going to have difficulties of the gravest kind to contend with. The speaker went on to allude to the attitude of the South Wales miners, and emphasized the necessity of educating not only the workmen themselves, but the men's responsible leaders. Probably the only way to do this was by interesting the workman in the result of his labour. This arrangement was the most equitable one, because it probably gave the best results in the long run. No doubt a good deal could be done by instilling into the workman and his leaders the principles of economics; but so long as the working man stuck to the heresy that the less work done the better for the working man, they could not hope to advance much. He was convinced that the best weapon they possessed for advancing the national industries as a whole was by giving the man an interest in the work he did. He endorsed Mr. Reid's view as to the working man's suspicion of motives, and agreed with that speaker when he declared that it was not every workman who cared to work now for the remote and contingent profits of three, six, or twelve months hence. Some few years ago a North of England colliery proprietor of his acquaintance was approached by a deputation of workmen who sought his advice as to what they should do with their surplus money—they had been earning very good remuneration for some time past. The advice of his friend to the men was to put their money into the 6 per cent. debentures of the company, adding that it would be perfectly safe. The answer of the men, however, was that this would not do—they were "ower young to save." What would profit-sharing have done for this class of man? A great number of working men had no necessity or wish to increase their incomes. What they wanted more particularly was to have less time for work and more time for play. He was speaking from his own experience of Tyneside workers, where one saw the condition of things most markedly in the shipyards. Before they could venture on a method such as that advocated by Sir William Lever, they must go through a slow and progressive stage of educating the workers. He desired to make it clear that he was not speaking in any sense with the idea of objecting to co-partnership or profit sharing. Something on these lines was badly needed; but he had his doubts whether a method such as had been advocated was the proper remedy.

Mr. Charles Carpenter, D.Sc. (President-Elect of the Society), said the average workman to-day was not a contented workman, and the general impression in his mind was that he was not receiving a fair share of the profits to which he was justly entitled, and to which he had every reason to expect that he should share in. He had been working under co-partnership principles for twenty-seven years, and was very pleased to be able to welcome Sir William Lever and his large undertaking as one of the recruits of the principle, more especially as in the early days when co-partnership was first taught Sir William was not in favour of it. He had, however, grown to be in favour of it, and was to-day one of its staunchest supporters. Personally, he did not think the bonus system was the solution of the difficulty at all. By inducing the working classes to take the same intelligent interest in the welfare of the industry as did the middle classes, they would go a long way to get over their difficulties. The principles of co-partnership were as applicable to the establishment employing 10,000 men as to the undertaking with 40,000 or 50,000 men.

Dr. Gilbert J. Fowler (Manchester) said the whole trend of the discussion showed that not only was it desirable, but it was apparently necessary, to increase the interests of our workmen in the work they had to do. The only point of difference seemed to be what was the best means of achieving it. A friend of his was about to undertake new employment, and it was his intention to acquire a thorough knowledge of his duties by going through the workshops from the lowest rank and working himself up. It was in this kind of direction that they would have to look forward for improvements in the relationship between capital and labour. Many of the great industries to-day were built up by men who had gained practical experience in the workshops, and knew all there was to know about the products they were handling. If they were to advance in their chemical industries, it was very necessary that those who were going to control them should first acquire the practical experience gained by going through the mill. Just as officers and men were fighting side by side in the trenches to-day, so, too, in the new era would they find that all classes would have to work together. The apparent conflict of interests and the occasional mistrust of one another would have to be eliminated.

Professor William A. Bone said he had listened to Mr. Carpenter's remarks with pleasure and interest. It was, of course, more difficult to apply co-partnership principles in an industry like iron and steel than in a gas company, where prices did not fluctuate greatly or the profits differ appreciably from year to year. A good deal of discrimination was needed in order to apply the principles satisfactorily between the different branches of industry.

Mr. Hulme Lever briefly replied on the discussion, and remarked that the greatest compliment that could be paid to the author of any paper was to have his remarks followed by interesting discussion.

## WELSBACH LIGHT COMPANY, LIMITED,

### Business under War Conditions.

The Ordinary General Meeting of the Company was held on Wednesday last, at Winchester House, Old Broad Street, E.C.—Mr. J. R. YATES, the Chairman, presiding.

The SECRETARY (Mr. E. J. Butcher) read the notice convening the meeting, and the Auditors' certificate; and the report and accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said that for the second time they met while under the shadow of the great war. When he last addressed them, a few weeks after hostilities began, he indicated that the war must affect the Company, not merely to the extent common to most commercial businesses, but more so because the incandescent lighting trade had in the past been largely dependent for supplies of raw materials upon foreign countries. He then stated that steps were being taken to minimize so far as possible any detriment which might consequently occur to the interests of the Company. In this connection, the general policy of the Board, and particularly that of endeavouring to secure and maintain the control of ample cash resources, had, he thought it might be fairly said, stood the Company in good stead—at any rate, up to the present stage of this unexampled upheaval. It was not merely that the cost of raw material of various kinds had so much increased, but that there had been occasions when it had not been merely a question of price, but of obtaining the material at all, within the necessary limit of time. He was glad to be able to say these problems had been successfully grasped and dealt with up to the present. He had thus briefly referred to the effect of the war on the Company's position as buyers. As sellers, also, they, in common with other British manufacturers of gas-mantles, had had to meet competition which it would be flattery to call legitimate. While British manufacturers had, perforce, to raise their prices, consequent on the increased cost of raw material, of labour, and of all incidents of production, attempts had been made, and with too great success, to flood the country with cheap Continental goods of dubious origin, but through neutral channels. To try to meet and defeat this campaign had involved much care and vigilance. As one illustration of this—and it might be multiplied—he would refer to the fact that within the last week or two they had discovered that a trading concern in the North of England was importing cheap mantles in plain boxes bearing no marks, and that on arrival in this country they promptly stuck on the boxes containing these inferior importations one of the Welsbach Company's trade marks the word "Palm," and sold them as "Palm" mantles. As the result of their activity, they had obtained an apology, which they were authorized to publish, and a delivery-up of the offending labels, together with an undertaking against further infringements. The only effective way in which purchasers could guard against these doubtful mantles, was to refuse to buy any that did not bear the name of a known and recognized English manufacturer. As the shareholders were aware, "Welsbach" mantles were made solely at the Company's Wandsworth works, by British labour. The Company had from time to time informed the Government Departments dealing with the matter of all seeming irregularities that had come under their observation. The authorities pointed out to them that, under a notice issued in April last, all such imported goods must have a British consular certificate to the effect that the consular officer was satisfied, from evidence which was produced to him, that the goods were not of enemy origin. Notwithstanding this fact, the Company discovered, some months ago, that goods so certified by consular authority were, in fact, of enemy origin, and exported since the commencement of the war; and it was through representations made by them to the Home Office, and with the Company's assistance, that the Government instituted a prosecution at Bow Street for an offence of this character against the Dutch agent who negotiated the transaction. Ultimately the prosecution was, after a statement by Counsel for the Crown, withdrawn, as it was felt the Dutch agent concerned had possibly, if not probably, acted innocently. There had naturally been a tendency for expenses to increase all round. This could not always be met by increasing prices to their buyers; and, regard being had to these facts, the shareholders would, he thought, agree that the trading profit of over £20,000, being an increase of some £6670 over last year, was not unsatisfactory. The profit and loss account indicated that the steady recovery of the business from the very serious position in which the Board found it at the reconstruction of the Company had not been arrested, even by the war. The figures for the four years of the present Company were: 1912, trading loss, £4345; 1913, trading profit, £5694; 1914, trading profit, £13,461; 1915, trading profit, £20,134. The trading for the current year was shaping as well as, under all the circumstances, could reasonably have been expected. The dividend on the shares in B. Cars, Limited, £7040, was the most pleasing item in the profit and loss account, and more than justified the judgment of the Directors in negotiating the acquisition of this business two or three years ago, and at the same time securing for the Company the valuable services of their present Managing-Director. In 1913, he said at the meeting that the Directors believed this investment was likely to prove satisfactory. He hoped the shareholders would agree with him that this modest statement had been more than verified. This handsome dividend was the more opportune at the moment in the absence of the receipt of any dividend whatever from the Austrian Company, from which last year they received £7358. It had been ascertained that a dividend of 5 per cent. on the Austrian Company's shares was declared in December last; but for obvious reasons, no part of it had reached this country. On the debtor side of the profit and loss account, repairs and depreciation of property, plant, and furniture were somewhat up; but where one was dealing, among other things, with a large quantity of intricate machinery and plant requiring replacement or renewal, it became necessary to make adequate provision, which, to the best of the judgment brought to bear upon the matter, had been done in this case. With regard to the balance sheet, the item of goodwill, patents, &c., of the Company's business was still further reduced by the profit on the debenture stock redeemed, and it now stood at the comparatively moderate sum of £7508. The figure representing the Austrian shares was one which must give cause for reflection. Even if they knew when the war would end, they would have very great difficulty in forecasting what would be the actual value of these shares when peace came. With regard to the freehold property, he mentioned in his speech last year that additions and alterations were being made, which were in this year's balance-sheet represented by the item of £10,731. The alterations gave an addition of nearly 30,000 feet of floor space, besides lifts, cranes, and labour-saving devices, greatly facilitating the conduct of the business; and they had let to Lloyds Bank on lease, at a handsome rental, the old show-room and part of the basement. Stock in trade, £25,637, was down to the extent of about £9000. With regard to investments, it was felt right to support the War Loan of last year by subscribing £5000, and again this year by applying for a similar sum, which, with the addition of 5 per cent. cash, would give conversion rights over the holding in the old War Loan. With reference to Consols, the question of converting these would in due course be considered by the Board, in consultation with the Trustees. As to the cash on deposit, it would be observed that they had succeeded in obtaining both the £15,000 from the Dresdner Bank and the £12,500 deposited with the Commerz und Disconto Bank, about which some questions were asked last year, and the recovery of which involved special vigilance and activity. On this topic he could enlarge, only it would take up some time; but the story of the recovery of the money was an interesting one, and he hardly thought it was likely to be repeated. At any rate, it resulted in £13,500 of hard cash coming over from Germany to this country within the last two months; and on this achievement he claimed the Board merited the support of the shareholders. The last item on the right-hand side of the balance-sheet, £65,000, representing commission in relation to the reconstruction, was one which, in the interests of the strength and stability of the Company, the Directors would like to see gradually written-down. Some questions were asked last year about the purchase of larger amounts of debenture stock, instead of placing money on deposit; but they would have done much worse for the Company had they, during the earlier years, sunk more of the available cash in procuring debenture stock at the prices then ruling, and would have jeopardized the commanding position which their cash resources had given them throughout a period of very considerable financial difficulty and constantly changing aspect. Speaking generally, the future was still a matter of uncertainty and gravity; but if there was any one thing as to which one was justified in feeling fairly sure it was that there would be a serious shortage of capital in this country, and that a commercial concern with sufficient cash resources would have a better prospect of weathering the storm than those that were pinched with poverty. On the other side of the balance-sheet, the debenture stock outstanding had been reduced to £212,522; the purchases during the year amounting to £5606 nominal. The deferred liability to pay for goodwill had been reduced from £12,500 to £10,735; and, lastly, the balance of profit and loss was £5708. In view of what he had already stated as to the necessity of conserving the resources for the present, and having regard to all the facts appearing on the balance-sheet, and to the obligations as regarded debenture stock and sinking fund, he felt sure that the proprietors would support the Board in the view that this sum should be carried forward. Of the hands employed at the Company's factory and in their different branches, to the number of some 800, it was not unimportant at the present juncture to note that a very large proportion were women; so that to this extent their demand for labour was not competing with the military requirements of the Empire. Of the male staff, a large proportion of those available for military service had enlisted. Encouragement had been given to them to do so; due provision having been made for their dependants, and for their resumption of work if (and when) they were able to do so—as it was hoped they would be. Most of the shareholders were doubtless aware that the Company had contracts from time to time with the great Government Departments, besides the chief railways, municipal corporations, and others; but it might interest them to know that they had recently installed some plant and machinery which placed them in a position to deal with munitions of war. The Board regretted that Major Pringle, now in command of Drake's Island, Plymouth, was unable to be present; and, while referring to the Directors, he alluded with satisfaction to the fact that Mr. Charles Lock, whose financial and commercial experience were most valuable to the Company, had yielded to a request that he would place this experience at the disposal of the Company as a Director.

Lieut.-Colonel C. M. CROMPTON-ROBERTS seconded the motion.

Mr. A. KING remarked that the balance-sheet showed, to his mind, that the Company was really more of an investment company than a trading or manufacturing one. Of the investments, far and away the largest part was in the Austrian Company. Now, whatever might be the result of the war, one thing was certain—and this was that anything in the nature of cordial relations between Germany and England would be for a long time undesirable ["Hear, hear."], or even impossible. Would it not be possible to take this opportunity to get rid of this large Austrian asset? The Chairman had said that one of the things which would have to be faced in the future would be a shortage of capital in the country. Which would it be better to have at the end of the war, £179 000 in cash or shares in the Austrian Company?

The CHAIRMAN said he thought they would all agree that £179,000 in cash would be a matter deserving of favourable consideration, if they saw it on the table in front of them; but as it was not there, he could merely promise that the subject would be kept in mind by the Board.

The resolution was then carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. B. CARS, Mr. Charles Lock was re-elected a Director.

Mr. LOCK, in acknowledgment, said he had accepted a seat on the Board at the urgent request of the Chairman, backed-up by Mr. Cars. For a long time he had taken a keen interest in the Company's affairs, and particularly in the re-building of the premises in the Gray's Inn Road. This work had been designed and carried out in a manner which would ensure the efficient working of the business.

The meeting concluded with the re-appointment of the Auditors (Messrs. Deloitte, Plender, Griffiths, and Co.).

## ACCRINGTON GAS AND WATER BOARD.

### Annual Report of the General Manager.

In his nineteenth annual report to the Chairman and members of the Accrington District Gas and Water Board, Mr. Chas. Harrison (the General Manager) says that, in addition to the adverse circumstances operating generally, the district of the Board has been heavily hit by a long strike, and by the unsatisfactory state of the cotton industry. Of the total decrease of £1740 in gas-rental, the falling off in consumption by manufacturers (11,243,000 cubic feet) is responsible for £1489. In addition, a drop of 2s. per ton in the price of coke reduced the receipts by over £2000. Repairs cost £1971 more, and other items brought the total reduction in receipts to £7361. In the twelve months, the number of consumers increased by 259.

The report of the Auditors is appended; and this shows that the capital expenditure on the two undertakings during the year ended March 31 amounted to £3733. Beyond this an outlay of £2187 has been made on the renewal of the retort-benches at the Great Harwood works, which is to be written-off by three yearly instalments. The accounts show that during the year the carrying on of the undertakings has resulted in losses on the gas undertaking of £5167, and on the water undertaking of £150, making together £5317, as against a profit for the previous year of £2732. The receipts have decreased to the extent of £6278; while the expenditure is £287 in excess of the previous year, in addition to which the fixed charges have increased by £1505. The total expenditure on the gas undertaking is only decreased by £84; a saving of about £1000 in the cost of manufacturing gas being absorbed by increases in the other items of charge in that undertaking. The leakage of gas, between the amount made and sold, stands at 10 8 per cent. of the total production, after allowing the usual 1·25 per cent. for gas used at the works.

## WARRINGTON GAS AND WATER UNDERTAKINGS.

### Reduced Profits for the Year.

The annual report of the General Manager (Mr. W. S. Haddock) to the Gas Committee on the working of the Warrington Corporation gas undertaking for the year ended March 31 expresses regret that the profits have fallen to less than £4000; this decrease having rendered necessary an increase in the price of gas by 5d. per 1000 cubic feet. After expressing the hope that the increase in price will only be temporary, Mr. Haddock points out that most goods are much increased in price, some being double the former rate.

The gross profit for the year amounted to £11,360, and the net profit (after allowing £4414 for interest and annuities, and £3143 for sinking fund contributions) to £3988, as compared with £8619 twelve months ago. The net amount received in respect of gas sales was £59,157, a decrease of £361; while meter-rental receipts yielded only £48, a drop of £580 on the year. This is explained to some extent in the report. It is pointed out that the demand for meters has fallen off, and shows considerable reduction in both expenditure and receipts; the large purchase of meters in 1913 having enabled the management to effect considerable saving—the costs under this head being the lowest since 1887. Dealing with residual products, the revenue from coke amounted to £15,709, as against £15,295, or £413 more than last year. Tar produced £165, or £19 less than 1914. But the largest reduction was in tar products, which yielded £4170, compared with £5325 a year ago, a reduction of £1154. The receipts from sulphate of ammonia were £5941, against £6811. The total yield from residuals amounted to £26,286. The report states that the reduced yield from tar products and sulphate of ammonia is caused by the lower price realized for the various products. The gas-fittings sold and work executed during the year yielded £1119, as against £1159 last year; miscellaneous sales £752, as against £861; rentals of cookers, £530, compared with £542 a year ago; and rents of cottages and land, £232. The total income was £88,127 for the year, as against £91,019 for 1914.

Dealing with the cost of manufacture. Coal and cannel (including benzol) amounted to £33,787, being £1385 more than last year; while carbonizing wages amounted to £8983, or £1440 over that of 1914. Repairs and maintenance of works and plant totalled £7635—an increase of £602 on the previous year's figures. Another heavy increase was in insurances and compensation, which amounted to £1125, or £757 more than the expenditure under a similar heading in 1914. The report explains that the heavy expenditure on coke (including labour and cartage), £1847, or £954 more than last year's figures, was caused by having to store an unusually large stock, which had to be handled twice. As already stated, the expenditure on meters (with repairs and maintenance) showed a considerable reduction on the year, being £2307 down; while the wages of meter inspectors (and clothing) amounted to £1391, a drop of £98 compared with the 1914 figures. Retorts and settings cost £952, or £67 less than the previous year; while mains and services (including repairs and maintenance) totalled £2450, against £3404 twelve months ago, a drop of £954. Lamp repairs and maintenance cost £43 less on the year; but this was more than counterbalanced by an increased expenditure of £66 on lamp-lighting. Cooking ranges, repairs, and maintenance accounted for £1477, against £1288; while the expenditure on tar and tar products manufacture amounted to £478, against £588 for 1914—sulphate of ammonia manufac ure being put at £1524 for 1915, as against £1450 for last year. Salaries accounted for £2859, a slight increase of £25; the total expenditure being £76,766, against £74,885 last year. The net increased total expenditure amounted to £1880, whereas the net decreased receipts were £2831.

As to working results, the coal and cannel carbonized during the year amounted to 55,462 tons, as compared with 51,522 tons the previous year; the gas made being, respectively, 561,697,000 cubic feet and 549,553,000 cubic feet– the increased make (12,144,000 cubic feet) being equal to 2·2 per cent. on the previous year's production. The gas made per ton of coal for 1915 was 10,127 cubic feet, compared with 10,666 cubic feet for 1914; the gas sold and accounted for during 1915 being 533,177,355 cubic feet, compared with 519,707,029 cubic feet last year. Unaccounted-for gas totalled 28,519,645 cubic feet, against 29,845,971 cubic feet for 1914. The average illuminating power was 16·11 candles.

The wages cost per 1000 cubic feet of gas made worked out at 10 283d., as compared with 9·394d. for the previous year. The cost of accounted-for gas into the holder was 13 663d., as compared with 11·194d. for 1914; while the cost delivered at the consumer's meter was 20·282d., as compared with 19·143d. The average price paid for coal and cannel during 1915 was 11s. 7·9d. per ton, against 11s. 11·5d. in 1914.

The gross income of the water-works undertaking for the period named was £31,987, against £33,029 for the previous year. Expenditure amounted to £11,735, an increase of £557 over the preceding year. The gross profit is given as £20,252, compared with £21,851 for the year 1913 14. After making provision for loan charges, the net profit on the year is £240, against £2012 for the previous year. It is pointed out that the income generally has been normal; last year's figures including £1137 for work done in connection with Warrington Bridge. The net profit has been carried forward, making the balance £7100; while the reserve fund, with the aid of £176 for interest on investments, has been brought up to its maximum of £10,000. During the year the capital expenditure has been £2679, and the amount of £6000 sanctioned in 1910 for the provision of new mains has now been expended. The loans repaid during the year amount to £6547; leaving a debt outstanding of £392,209.

## YEAR'S WORKING AT BURTON-ON-TRENT.

The report of the Committee on the working of the Burton-on-Trent gas undertaking for the year ended March 31 (which is signed by the Chairman, Alderman T. E. Lowe, J.P.), shows that the total revenue for the twelve months was £66,295, and the working expenses £54,854. The salaries and wages bonus on profits came to £349; the gross profit being £11,092. After meeting loan charges and other items (including £3102 for new meters, stoves, &c), there was a net profit for the year of £3561, as compared with £6263 for the preceding twelve months. This surplus has been allocated to the relief of the rates. While regretting that the result of the year's working does not compare favourably with those of recent years, they point out that, owing to the war, "business" has, with regard to gas undertakings, been far from "as usual."

Contracts were let in May, 1914, for the extension of the new retort-house, and for re-setting seven out of the ten beds in the first section erected in 1910. The work was to have been completed in August, and would no doubt have been ready within about six weeks of that time; but as soon as war broke out, contractors pleaded difficulty in obtaining workmen and proper delivery of goods, which resulted in the new beds not being brought into use until December. In addition to this, a number of the regular hands enlisted, and could not be replaced by men with the same aptitude for retort-house labour. The result was that gas making had to be continued in the hand-worked retort-house, with a class of labour not equal to the usual standard, and for a much longer period than was anticipated at the beginning of the year. A good deal of the loss might be attributed to these causes. Then the coke market was heavily depressed for some months after the outbreak of war, thus not only bringing down selling prices, but involving considerable additional expense in stacking it in the yard. Other items which had affected the net profit were the increased loan charges in connection with the extensions and the advances in wages, &c., granted in April, 1914.

According to the terms of the profit-sharing scheme which came into operation at the beginning of April last year, a bonus of 2½ per cent. would now be paid on the total salaries, wages, sick pay, and accident pay of the 215 employees of the Gas Department with three months' service or more. The earnings which participate in the bonus amounted to £13,954, on which 2½ per cent. represented £349.

The quantity of gas sold last year was 425 million cubic feet, and the number of consumers 11,852. With a total capital expenditure of £270,848, the outstanding debt is £45,167. The unaccounted-for gas was 4 68 per cent., against 4·8 per cent. in the preceding year. The average price received for gas was 2s. 2·06d. per 1000 cubic feet.

When submitting the report to the Town Council, Alderman Lowe pointed out that there was a decreased yield of gas per ton of coal, due chiefly to the fact that it had been necessary to manufacture gas in the old house, from which such good results were not obtainable. Residuals also had slumped. He hoped no member of the Council would attribute the drop in the profits to the management, by whom every care had been taken to secure the best results. Coal prices had been higher than was anticipated. The figure averaged 6s. per ton more than last year. When the Committee asked for an increase of 6d. per 1000 cubic feet on the price of gas, they anticipated an advance of 5s. per ton for coal; but it had gone up 1s. more. These facts would militate against the prospects for next year.

In the subsequent discussion, Mr. Bassett said it was a matter for congratulation that the gas sales were the largest on record in the history of the works. The returns were £633 in advance of any other year. The profits were only £3561, which was the lowest since 1894, and, with but one exception, the lowest for 35 years. He found there was a total capital outlay of £270,000, for which the ratepayers were only getting a return of £3561. For his own part, he could not say that he was satisfied. There had been a considerable quantity of gas sold for power purposes at cost price, and some for less than cost price. The actual net cost of gas worked out at 19·91d. per 1000 cubic feet. Gas was, however, sold at 1s. 6d. per 1000 cubic feet, and as low as 1s. 3d. How could a profit be expected? He trusted something would be done to remedy the inequality between the cost price and the actual selling price.

It was pointed out by Mr. Hutchinson that the position to-day was not due to cheap gas, but to the increased expenditure, which was

owing to the extraordinary circumstances created by the war. He asserted that when the price of gas was 6d. cheaper than it was to-day the undertaking made much greater profit, which showed that the decreased profits were not due to the advocating of cheap gas. Contracts for coal had been entered into by the Committee at the 6s. increase; but some contracts had been resumed at an increase of 4s. 9d. The Government were considering action to lower the price of coal; but the Committee had made their bargain.

In reply, Alderman Lowe agreed that the position was not due to cheap gas. Apparently the gas cost more than the price at which it had in some cases been sold; but this was if they took into consideration the whole charges of 19·91d., which included rates, rents, and fixed charges.

## CAPITAL DEPRECIATION IN SCOTTISH GAS-WORKS.

### Plant, Stoves, Meters, &c.

At a recent meeting of the Dundee Gas Commissioners a point was raised to the effect that no depreciation had been written-off gas stoves, fires, meters, &c., nor had the idle plant at the Broughty Ferry Gas-Works (recently taken over by Dundee) been duly considered. Consequently, Mr. Alex. Yuill, the Engineer and Manager of the Dundee gas undertaking, prepared and submitted to the Commissioners an exhaustive report on the whole subject, some extracts from which will be of interest in other quarters where similar questions may arise.

Mr. Yuill pointed out that at the end of the last financial year the capital value of the Dundee gas undertaking amounted to £429,363—a figure entirely unrepresentative of the actual and potential value of the undertaking as a going concern. Under normal market conditions, works capable of producing 1200 million cubic feet of gas per annum could not be constructed for less than £792,000—being equal to £660 per million cubic feet; and this amount, compared with the present written-down value of the undertaking, £429,363—even ignoring a sum in lieu of goodwill—shows a difference of £362,637 in favour of the department. On this basis of computation, it proves that the gas undertaking as a whole has been already depreciated through the sinking fund to the extent of £362,637; and compared with this estimate the actual total contributions to the sinking fund since the works were acquired in 1869 amounts to £376,776.

During the current year, he says, the payments to the sinking fund will amount to £17,900; and at this rate of redemption the entire capital debt of the undertaking (the Broughty Ferry works included) would be redeemed in less than 24 years—equal to a rate of 4·17 per cent. per annum.

He has prepared a table showing that on the last two occasions when borrowing powers were obtained, the periods of repayment were fixed at twenty-five years and twenty years respectively, and this notwithstanding the fact that the capital involved had steadily fallen from £1278 per million cubic feet of gas delivered in 1870 to the very low figure of £381 per million cubic feet in 1914, at which time the Secretary for Scotland reduced the period of redemption to twenty years.

To show that the Dundee gas undertaking is carefully guarded in respect of the rate of its capital redemption, Mr. Yuill mentions that a few months ago a corporation—while the construction of new works was proceeding—obtained parliamentary authority to redeem their capital indebtedness in forty years.

The fixing of twenty years (or a rate of 5 per cent.) for the redemption of loans means that capital debt is redeemed through the operation of the statutory sinking fund long before average gas-works plant becomes obsolescent. Under such circumstances, Parliament does not ask municipal gas undertakings to depreciate—this being fully provided for in the sinking fund.

The report continues: When discussing the question of depreciation, it frequently occurs that the financial operations of a private trading company are confused and identified with those of a municipal department, such as a statutory gas undertaking. To illustrate the difference, let us suppose that two gas companies have amalgamated, and that the purchasing company has decided to close-down the manufacturing station of the smaller company. In this case, a special depreciation fund is created to liquidate the value of the obsolescent plant. The absence of such a fund from the accounts of a gas undertaking is erroneously ascribed to bad finance. As a matter of fact, the property of a gas undertaking is more regularly depreciated than that of a private trading company, because it is bound by Statute not only to maintain the works in a good state of repair, but also to redeem the capital debt in a given number of years. In other words, the sinking fund of a gas undertaking is equivalent to the depreciation fund of a trading company; and, it may be added, the interest paid to annuitants, and for borrowed money, is to all intents and purposes equivalent to a trading company's dividend.

Mr. Yuill submits a statement as to the make of gas, capital charges, &c., at seven large Scottish works, which shows that Dundee compares very favourably with the other places in regard to its capital indebtedness, &c.

With regard to the Broughty Ferry Gas-Works, statistics are furnished to show by comparison how cheaply the works were acquired. At the present time the net capital indebtedness stands at £32,673; being equal to £435 per million cubic feet of gas sold. Had the works been acquired from a gas company, the cost, Mr. Yuill points out, would not have been less than £1000 per million; and under the Gas Supply (Scotland) Act it would have taken forty years to liquidate the debt by the operation of the sinking fund. To redeem the present capital debt of Broughty Ferry an annual sinking fund charge of £1412 is required, according to Statute. At this rate of redemption, the capital debt will be completely wiped out in twenty-three years—being equal to a rate of 4·32 per cent. per annum. Thereafter, it will only be necessary—so far as the Broughty Ferry works' capital is concerned—to meet the annual charges for the acquisition of annuities and the payment of annuitants in conformity with the Statutes.

The real point at issue, the report resumes, is: "Should the value of the idle plant and apparatus at the Broughty Ferry Gas-Works be written-off more rapidly than the plant still of service and in daily use?" To enable a decision to be arrived at, he has examined the idle plant, and estimates the value of it at about £10,500. The amount which may be set aside as depreciation, &c., can only be provided at the expense of the gas consumers. Therefore, in considering this question, it should be noted that any increase in the rate of capital redemption, either by depreciation or otherwise, would be immediately followed by an additional charge on the revenue of the department for local and Imperial taxation. Should the Commissioners decide to set aside an annual sum to wipe-out the amount, in addition to the existing statutory sinking fund of £1412 (which should suffice), then the department would be called upon to bear the burden of a voluntary and non-statutory revenue charge, *plus* an additional amount for taxation incident upon revenue having to be raised to meet these additional charges.

For example, each £1000 set aside for depreciation, out of current revenue, costs the department an additional sum of £375 for rates and taxes. That is to say, £1000 becomes £1375, which is equal to a premium of 37½ per cent.

The following statement shows the probable financial aspect of the question, and how it affects the revenue account:—

| | |
|---|---|
| (1) Depreciation on gas stoves and fires calculated at 10 per cent. on the present value | £5108 |
| (2) Depreciation of the idle plant at the Broughty Ferry Gas-Works (say) £10,000, repayable in five years | 2000 |
| | £7108 |
| (3) Extra for local and Imperial taxation at (say) 7s. 6d. in the pound | 2665 |
| Total | £9773 |

This represents a sum equal to 2·18d. per 1000 cubic feet of gas sold.

The following statement shows the sums taken from revenue (independent of sinking fund) for the depreciation of meters, stoves, fires, and new works during the undermentioned period:—

| | |
|---|---|
| 1902-03 | £6,728 13 6 |
| 1904 | 5,386 0 7 |
| 1905 | 3,795 3 9 |
| 1906 | 4,596 4 4 |
| 1907 | 2,964 15 0 |
| 1908 | 5,620 7 9 |
| 1909 | 4,676 8 0 |
| 1910 | 2,946 19 5 |
| 1911 | 7,529 14 2 |
| 1912 | 8,052 7 9 |
| 1913 | 4,176 13 11 |
| 1914 | 3,050 7 7 |
| | £59,523 15 9 |

In conclusion, Mr. Yuill adds that the Gas Commissioners are under no statutory obligation to depreciate plant and apparatus. "Therefore, in view of the fact that by the application of the sinking fuud the entire outstanding debt of the gas department will be redeemed in twenty-four years, no real benefit can accrue from the proposal to still further tax the gas consumer at the present time."

In an appendix to his report, Mr. Yuill gives the following particulars as to transfers of Scottish gas-works to local authorities:—

*Gas Undertakings Transferred to Local Authorities.*

| Year. | Town. | Gas Sold. | Price Paid. | Capital per Million Cubic Feet Sold. |
|---|---|---|---|---|
| | | Cubic Feet. | £ | £ |
| 1871 | Aberdeen | 110,000,000 | 162,500 | 1,476 |
| 1877 | Alloa | 18,160,000 | 23,250 | 1,287 |
| 1870 | Arbroath | 20,600,000 | 35,000 | 1,699 |
| 1914 | Bridge of Allan | 26,540,000 | 29,953 | 1,129 |
| 1910 | Carnoustie | 24,000,000 | 21,000 | 875 |
| 1873 | Dumbarton | 16,000,000 | 20,255 | 1,266 |
| 1870 | Dundee | 200,838,000 | 256,562 | 1,278 |
| 1888 | Edinburgh and Leith | 1,084,331,000 | 1,052,972 | 971 |
| 1895 | Falkirk | 52,639,000 | 85,267 | 1,620 |
| 1911 | Fraserburgh | 24,906,000 | 27,608 | 1,108 |
| 1869 | Glasgow | 962,950,000 | 869,062 | 902 |
| 1872 | Kilmarnock | 27,952,000 | 40,500 | 1,449 |
| 1910 | Kirkcaldy | 147,881,000 | 137,150 | 927 |
| 1914 | Motherwell | 104,975,000 | 135,987 | 1,295 |
| 1901 | Newport (Fife) | 9,814,000 | 10,500 | 1,528 |
| 1871 | Perth | 32,500,000 | 45,000 | 1,385 |
| | | | Average | £1,262 |
| | Broughty Ferry | £75,000 | Outstanding Debt, £32,693 | £435 |

## GAS PROFITS AT BARNOLDSWICK.

### Economies Effected with Vertical Retorts.

In spite of adverse circumstances, the operations of the Barnoldswick gas undertaking during the past financial year have resulted in more than a doubling of the profits of the previous year—due, in the main, it is said, to economies effected by the installation of vertical retorts eighteen months ago.

In his annual report, the Gas Manager (Mr. J. W. Thompson) remarks that on this occasion it is opportune to take a more general survey than has been customary in the past; for the reason that this year marks the completion of the policy of extensions adopted eight years ago. The employees had done their best to make the year a success. This was the first year it had been possible to carry out a

thorough and searching test of the Glover-West vertical retorts, and to say the results exceeded anything anticipated a few years ago was only expressing what they now knew. The Contractors guaranteed to make 11,500 cubic feet per ton of coal, of the statutory candle power, which was very much above the average for coal gas. The actual make had been 12,355 cubic feet—not only above the statutory candle power, but of a constant and high calorific value. There was no doubt that every advantage claimed for the plant by the makers had been more than fulfilled. To make a full year's comparison of the working results of the verticals with the old horizontal retorts, it was necessary to compare the year under review with two years ago. The quantity of coal carbonized had been 6168 tons, against 6366 tons two years ago. This showed a saving of 198 tons, though the make of gas had been 12,999,200 cubic feet more. In the same periods, the wages paid for stoking were respectively £307, against £795, or a saving of £488. The department has assisted the ratepayers by contributing £750 to the district fund; otherwise there would have been an increase of 4d. in the pound on the rates. The unaccounted-for gas was 4·6 per cent.

For the previous year the profits were a record of £1263; but on the present occasion they have bounded up to £2630. "This," proceeds Mr. Thompson, "is a feature that requires no further comment. With such excellent results, some may be tempted to ask: 'Why not reduce the price of gas?' Well, for many reasons; the chief of these being that we are confronted with a possible increase in the cost of coal to the tune of £1800, and also a probable reduction in the value of residuals. We are fairly strongly placed to go through the current year with gas at the same price; and this is a valuable asset to the town. It is necessary to reconsider the price of coke, which is being sold considerably under its market value. There are no immediate hopes of making further economies in carbonizing, handling of coal, and residuals; so that we only have one field open to us—that is, suitable plant for making our residuals more valuable, which will be introduced at an opportune time."

## TYLDESLEY GAS SUPPLY.

### The Past Year's Working Results.

There has just been issued the annual report of Mr. Hedley Hoy, the Manager of the Tyldesley-with-Shakerley Urban District Council Gas and Water Department, giving the working results for the year to March 31.

In the Gas Department the total receipts amounted to £9490, and the expenditure to £7384, leaving a gross profit of £2106. Out of this sum, £2010 has been paid for interest and sinking-fund charges (equivalent to 9·67d. per 1000 cubic feet of gas sold), leaving a net profit on the year's working of £96, which has been carried forward—making the balance carried forward £3101. The reduced profit was said to be due to the decreased receipts from the sales of residuals. The expenditure on capital account was £493. The amount of loan capital owing at the commencement of the year was £14,103, £800 was added during the past year, and £1415 was paid off—leaving £13,487 outstanding.

The total gas made was 60,116,000 cubic feet, of which 1,465,000 cubic feet was carburetted water gas. The increased output was 1,046,000 cubic feet, or 1·74 per cent., as against an increase of 8 per cent. the previous year. The make of gas per ton of coal carbonized was 10,838 cubic feet—a slight decrease on last year. The gas consumption was 49,906,000 cubic feet—an increase of 823,000 cubic feet, or 1·65 per cent. The amount of gas used by prepayment consumers showed an increase of 1,991,700 cubic feet; but against this, there was a decreased consumption in the case of ordinary consumers for lighting of 1,329,900 cubic feet. The amount collected from prepayment meters was £2308—an increase of £301. The average price obtained through these meters was 3s. 3·1d. per 1000 cubic feet. The average annual consumption per consumer was 8921 cubic feet. The unaccounted-for gas was 15·4 per cent., against 14·9 per cent. last year.

The average cost of coal was 12s. 5·82d. per ton, being 4·13d. per ton less than the past year. Coke returned 4s. 4·88d. per ton of coal used, and tar and liquor 2s. 8·37d.—making the return for residuals 7s. 1·25d., or equal to 56·90 per cent. of the cost of coal.

The usual repairs to mains and services, in consequence of subsidence, also the renewal of old and leaky services, occupied considerable time and attention. The repairs and maintenance of works carried out included the resetting of one bed of retorts, and the provision of new mouthpieces for same.

## PROFIT-SHARING AT BURTON-ON-TRENT.

### The System Explained.

A profit-sharing scheme was inaugurated by the Gas and Electricity Committee of the Burton-upon-Trent Corporation, to come into operation as from the beginning of the past financial year. In explaining the principle to the men, the Gas Manager (Mr. R. S. Ramsden) says the object of the scheme is to give all the employees of the Gas Department an inducement beyond their salaries or wages to take a greater interest in their work and in the welfare of the undertaking. The principles on which it is based are:

That when the total net expenditure for manufacturing (less the receipts from residuals), distribution, and all other charges, exclusive of interest and repayment of loans, shall be, in any year, less than 2s. per 1000 cubic feet of gas sold, then the employees of the Gas Department shall be entitled to a bonus on the salaries, wages, sick pay, or accident pay received by them, calculated at the rate of ½ per cent. for every 1d. or fraction of 1d. below the said 2s.

That the distribution of bonus shall be *pro ratâ* on the sums actually

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received by the employees during the year, and shall be paid after the annual accounts (which are made up to March 31 in each year) have been adopted by the Gas Committee. That no bonus shall be divided among the employees who shall have been employed in the department for less than three months during the year in which the bonus has been earned. The Committee have power to withhold the bonus from any employee who, in their opinion, is not deserving of the same, owing to inefficient work, indolence, or misconduct.

On the basis set forth, the bonus for the year 1913 would have been 5½ per cent. The wages and salaries for the year amounted to roughly £10,000; and 5½ per cent. on this would have been £550. Taking the case of a man whose wages averaged 25s. a week, or £65 for the year, 5½ per cent. represents £3 11s. 6d.

It is up to every man and youth in the employ of the Gas Department, in his own interest, therefore, to strive his utmost to work the undertaking more economically and efficiently. Each employee should have a good idea how to employ his time and the materials which he uses to the best advantage; and when he sees that salaries and wages, or, in other words, expenditure on time, amount to about one-half of the net working expenses, he will realize that time is the most valuable commodity with which the gas undertaking has to do.

## LIVERPOOL CORPORATION WATER SUPPLY.

When the European war broke out, at the beginning of last August, the Liverpool Water Engineer, Mr. J. R. Davidson, being a Major (now Lieut. Col.) of the 10th Battalion, King's Liverpool Regiment (Liverpool Scottish), was called away to active service with His Majesty's forces. On Aug. 11, the Consulting Water Engineer (Mr. J. Parry, M.Inst.C.E.), who had retired on May 30, 1914, took over Mr. Davidson's duties for the period of his absence. Under the circumstances, it appeared undesirable to prepare an annual report in the form hitherto adopted; and on the recommendation of the Consulting Engineer, the Water Committee approved the omission, and authorized the separate printing of the annual statistics and statements of work done, to maintain the continuity of the records.

These show that the average quantity of water supplied per day in the year ended Dec. 31 was 39,344,000 gallons, and the mean population served was 1,189,886. The corresponding figures for 1913 were: Average per day, 37,163,000 gallons; population, 1,174,555. The increase in consumption for the year, therefore, was 2,181,000 gallons per day. The quantity of water supplied in the compulsory area was 12,508,947,000 gallons, or at the average rate of 37·013 gallons per head per day. Adding the outside area made a total of 14,321,230,000 gallons. The sources of water were: Vyrnwy, 8,763,980,000 gallons; Rivington, 4,327,623,000 gallons; and wells, 1,229,627,000 gallons. The number of new water tenants added during the year within the compulsory limits of supply was 1308; and the length of new mains laid was 4 miles 1041 yards. There were 117,805 inspections made for the detection of waste; and 28,018 defects were discovered. Of these, 7128 were repaired at the time of inspection.

With regard to new works, early in 1914 the Committee authorized the Engineer to proceed with the preparation of plans for the construction of two new filter-beds at Oswestry, to meet the increasing demands for Vyrnwy water in Liverpool. Mr. H. N. Giles, who was appointed to assist in the preparation of the plans, had completed the preliminary surveys, when he was called away to join the forces, having previously held the rank of Captain in the 1st Volunteer Battalion of the King's Liverpool Regiment. In connection with these works, a contract was entered into in October for 640 yards of 30-inch cast-iron pipes to be laid from the Llanforda reservoir. The existing filtration works for supplying the town of Chorley having been found inadequate to maintain an efficient and constant service during the summer months, designs for a new filtered-water tank were submitted to, and adopted by, the Committee. Application was made to the Local Government Board for sanction to borrow the necessary capital; and this sanction having been obtained, tenders for the construction were invited. The outbreak of the war caused some delay in commencing operations; but the Contractors made a start in September, under the supervision of Mr. A. S. Mason, as Resident Engineer. In November, the Committee authorized the Engineer to obtain tenders for a new pumping-engine and boiler required to meet the increasing demands for water in the town of Prescot.

The revenue last year on ordinary account was £386,835, and the expenditure £378,507.

## NOTES FROM SCOTLAND.

**From Our Own Correspondents.**

*Saturday.*

In submitting the statement of accounts for the year ended May 15 last to the Edinburgh Town Council, Treasurer M'Michael pointed out that in the Common Good account the surplus for the year was £4560. While there were no exceptional features in the items of revenue or expenditure, the cost for public ceremonies and entertainments was up to the average of recent years, even though such functions had been practically suspended since the outbreak of war. This circumstance, the speaker pointed out, was to an extent accounted for by the somewhat lavish hospitality extended last July to a large and representative party of German Burgomasters—"one more proof of our native guilelessness, and our absolute unpreparedness for war." Dealing with the ordinary police accounts, he said that at the beginning of May last they were sufficiently assured of savings in certain departments, due mainly to the postponement of work sanctioned, to justify him in putting the unexpended balances at £15,000. The Council would be gratified to

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know that the total surplus at the close of the year amounted to no less than £31,000—the year having been begun with unexpended balances of £20,000. This result had been brought about by economies effected in practically all the large spending departments, and by savings on interest; there having been no increase in the estimated yield from the burgh assessment. Primarily, he attributed the result to the prudence and foresight exercised by the official heads of their departments, who, from the outset of the crisis, and acting in conjunction with their Conveners, deliberately set themselves to delay all work capable of being postponed, and at the same time gradually reduce their staffs accordingly. On lighting there was a saving of £9000, brought about by the restricted service with which they had all become familiar.

Obviously, in connection with the position of affairs just quoted, no case is made out for the suspension of sinking funds during the war. But, as Mr. A. Canning Williams (the Treasurer of the Edinburgh and Leith Corporations' Gas Commissioners) pointed out in a letter read at a meeting of the Annual Committee of the Convention of Royal Burghs in Edinburgh last week, the suggestion to suspend the sinking funds is of great importance to certain branches of municipal enterprise—and applies with particular force to gas undertakings, inasmuch as they are trading concerns which feel the full brunt of increased prices for material, and are not in a position to economize, as is the case with some of the non-trading departments of a corporation, where by reduced expenditure a considerable set-off against additional outlay in other directions is secured. In the course of his letter, Mr. Canning Williams further pointed out that, owing to the very large additional cost of coal and other material, to war allowances and bonuses, and other exceptional expenditure due to the war, the Commissioners will be reluctantly compelled in the autumn to increase the price of gas. The annual contributions to the sinking funds of the undertaking are equal to 3½d. per 1000 cubic feet of gas sold; and, while their suspension would not render unnecessary an increase of price, it would reduce the amount of it to this extent, and so save the gas consumers of Edinburgh and Leith some £29,000 per annum. Under these circumstances the Commissioners trusted that the Committee would decide to take early action, and that it would be successful. At the meeting of the Committee referred to, a resolution was passed to the effect that the members generally were of opinion that, in the interests of sound finance, the suspension of sinking funds was to be deprecated; but they recognized that in some special cases the postponement of capital repayments might be expedient for reasons specially due to the war, and, on good cause shown, they recommended such action to the favourable consideration of the Scottish Office.

Mr. J. Napier Myers, the Manager of the Saltcoats Gas Company, Limited, is to be congratulated on the results of his working for the twelve months ended May 31 last. The Directors' report shows that the balance at the credit of the profit and loss account (after providing for depreciation of the works) amounted to £1584, which was apportioned as follows: In paying a dividend of 8 per cent., free of income-tax, amounting to £1280; in paying a bonus of 1 per cent., or £160; and carrying forward to next year £144. During the year the consumption increased by 2,160,000 cubic feet. It was pointed out that the carbonizing plant had been considerably increased by an extension of the retort-bench, which necessitated the removal of the old, and the erection of a new, chimney. Certain of the Company's mains in the central district had also been enlarged. The average cost of coal bought was 14s. 6d. per ton; and the gas made totalled to 35,240,000 cubic feet, or 10,170 cubic feet per ton of coal carbonized. There are 2785 consumers and 285 public lamps in the Company's district.

At the annual meeting of the Cupar Gas Company, the Secretary and Manager (Mr. James Macpherson) submitted the financial statement, which showed a profit on the year's working of £1336, to which had to be added the balance from the previous year, amounting to £105, making a total credit balance of £1441. It was recommended that £400 be written-off for depreciation, £29 allowed for Directors' and Auditors' fees, and £806 expended in dividends, leaving a credit balance of £206. The Chairman (Hon. Sheriff William Thomson) said the consumption of gas during last winter was a record one. The increase was chiefly attributable to Cupar having been made a military centre. The Directors recommended an increase of 9d. per 1000 cubic feet in the price of gas. Dividends were declared of 5 per cent., less income-tax, on the preference stock, and £2 per £30 ordinary share, tax free.

The annual report and balance-sheet of the Brechin Gas Company show the sales of gas for the year to have amounted to £5832, of which £2659 was through prepayment meters; while the income from residual products was £1059. After meeting all charges, a balance of £1783 was carried to profit and loss account, making, with the balance of £184 brought forward, a total of £1967 at the credit of the fund. From this there has been paid for preference share dividends and interest on debentures (less income-tax) £317, written off for bad debts £20, depreciation £250, new gasholder £50; leaving a net balance of £1330, which the Directors recommend should be allocated in the payment of a dividend of 18s. per share on the ordinary capital (less income-tax), £1215, leaving a balance of £115 to be carried forward, subject to such remuneration as may be voted to the Directors. A proposal is made, in view of the high price of coal, that the price of gas be increased for lighting purposes in the Brechin district to 4s. 4½d. per 1000 cubic feet, and 5s. 4½d. in the Edzell district; and for heating, cooking, and power purposes, to 3s. 9d. in Brechin, and to 4s. 9d. in Edzell.

The Castle Douglas Gas Company have fixed the price of gas at 3s. 9d. per 1000 cubic feet—an increase of 5d. The Company have decided to pay a dividend of 7 per cent. The Pitlochry New Gas Light Company have paid 5 per cent. dividend. Another Scottish Company—Renton—have also paid 5 per cent.; and the Vale of Leven Gas Company are paying 7½ per cent.

**Tar Products, Limited.**—A joint-stock company having this title has been registered, with a capital of £12,000 in 10s. shares.


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## CURRENT SALES OF GAS PRODUCTS.

### The London Market for Tar, Tar Products, and Sulphate.

LONDON, *July* 19.

Pitch continues quiet, and the price remains without change at 26s. per ton in bulk at makers' works. Other values are: Creosote 4½d. to 4¾d. net in bulk; 60's crude carbolic acid, 3s. 6d. per gallon net; 48-50 per cent. anthracene, 2¼d. per unit, casks free. Tar spirits are scarce; most of them being taken up for Government purposes. The tone of sulphate of ammonia continues good; there being no alteration in the price reported last week of £14 8s. 9d. per ton net into buyers' bags, at makers' works, for 25 per cent. quality.

### Tar Products in the Provinces.

*July* 19.

The markets for tar products have remained fairly steady throughout the past week. The high prices being asked by the distillers is preventing business in pitch at the present moment. Solvent and heavy naphthas are fairly firm, though business is reported in the former at slightly lower prices. Creosote is weak, and difficult to sell. Crude carbolic maintains its price.

The average values of gas-works products during the past week were: Gas-works coal tar, 21s. 6d. to 25s. 6d. Pitch, East Coast, 22s. to 23s. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 20s. to 21s. Manchester; 21s. to 21s. 6d. Liverpool; 23s. to 24s. Clyde. Benzol, 90 per cent., naked, North, 10½d. to 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Crude naphtha, in bulk, North, 6d. to 6½d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3d. to 3 1/16d. Heavy oils, in bulk, 3 7/8d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 6d. Naphthalene, £8 to £16; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. per unit; "B" quality, nominally ¾d.

### Sulphate of Ammonia in the Provinces.

LIVERPOOL, *July* 16.

Although the market for this article has remained rather quiet throughout the week, the tendency of prices in the near position has been to harden slightly. The volume of new orders from direct buyers has been less than that recently experienced, but all available supplies have been readily absorbed by middlemen. The nearest prompt values are now £14 13s. 9d. per ton f.o.b. Hull, £14 16s. 3d. f.o.b. Liverpool, and £15 1s. 3d. f.o.b. Leith. There has been no change in the situation so far as forward delivery is concerned, and the quotations are still £15 2s. 6d. f.o.b. Liverpool, and £15 5s. per ton f.o.b. Leith, for October-March shipment.

### Nitrate of Soda.

This market is again firmer, and holders on spot now require 12s. 3d. per cwt. for ordinary, and 12s. 6d. for refined quality.

### Sulphate of Ammonia.

From another source it is reported that, although this market has remained steady, the number of new transactions are not very large. Outside London, makes are still quoted at £13 15s.; Hull, £14 15s.; Liverpool, £14 17s. 6d.; Leith, £14 17s. 6d. to £15; Middlesbrough, £14 15s.

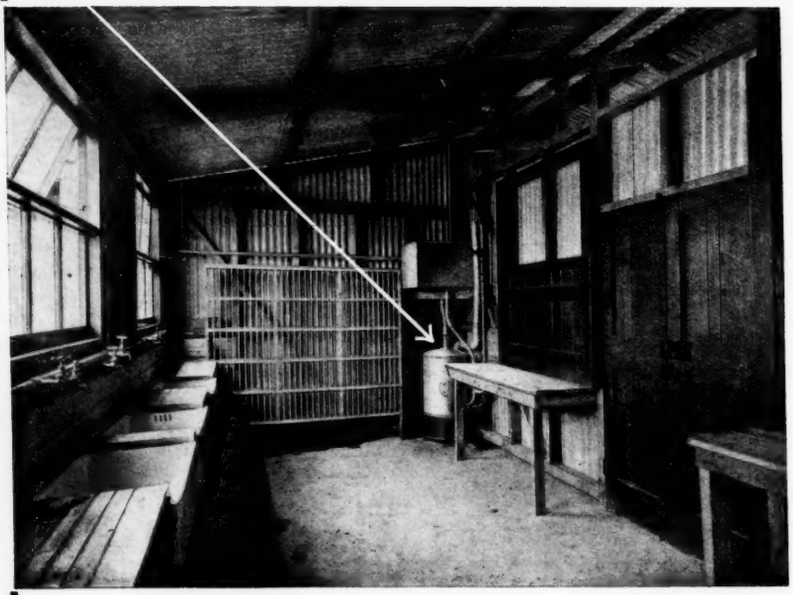
## COAL TRADE REPORT.

### Northern Coal Trade.

The coal trade is rather irregular, and the effect of the Limitation of Price Bill is beginning to be felt in some degree; but the largeness of the exports (which are exempted) will minimize the effect on some parts of the northern coalfield—that is, to the allied countries, to which licences are not needed. In steam coals, best Northumbrians are about 21s. to 22s. per ton f.o.b.—the Welsh crisis having given some stimulus, though it may be only temporary. Second-class steams are 16s. 6d. to 17s. per ton; and steam smalls are from 13s. 6d. to 15s. In the gas coal trade, the demand is steadier. Best Durhams are from 20s. to 21s. per ton f.o.b.; second-class gas coals are unaltered at 17s. to 17s. 6d. per ton; and "Wear Specials" are 22s. to 22s. 6d. per ton f.o.b. The freights are a little easier, based on about 7s. to 7s. 3d. Tyne to London. Some of the coal prices are likely to be materially affected by the duration of the Welsh strike. There have been few contracts for gas coals of late; but some large sales of Durham coals have been made to France, which will stiffen the market, and may thus influence the gas coal position. It is not anticipated that the new Coal Bill will much affect Durham coals, as contracts are usually long. The coke trade is steady. Gas coke is firm and scarce—shipments having been heavy of late, though, of course, below the average at this season. Stocks are generally low. For good gas coke, the current price is from about 27s. 6d. to 29s. per ton f.o.b. on the Tyne, with a fair demand.

**Bradford and the Price of Coal.**—The Bradford City Council, in approving the Gas Committee's recommendations for the increase of gas prices, added the following: "And that, in view of the fact that the increased price of gas is largely necessitated by the extraordinary rise in coal prices, the Council urge the Government to give immediate effect to the recommendation of the Departmental Committee on Coal Prices, 'that if prices do not shortly return to a reasonable level, the Government should consider a scheme for assuming control of the output of collieries during the continuance of the war.'"


# THE "ZENITH" GAS-HEATED BOILER



The "Zenith" installed in the corner of a cookhouse of a temporary Military Camp.

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## Manchester Gas Department's Roll of Honour.

How well the employees of the Manchester Corporation Gas Department have answered their country's call is shown by the Roll of Honour, giving the names of those who had joined the Colours up to March 31 last. It contains no less than 502 names; and a summary appended shows that the various works and departments are represented as follows: Clerical staff (Town Hall), 31. Meter department—Ordinary, 24; automatic, 27; stores, 9. Stoves department, 77. Private lighting department, 5. Gaythorn station, 36. Rochdale Road station, 32. Bradford Road station, 111. Droylsden station, 2. Street mains and lighting department, 148.

## Mansfield Gas Undertaking.

At a meeting of the Mansfield Town Council last Friday evening, Dr. Tarachand drew attention to the fact that, at the previous meeting, he directed notice to the circumstance that there was a deficiency in connection with the gas undertaking of £2000. It was interesting to know that since then a report of income and expenditure had been issued by the Gas Manager (Mr. W. J. Rendell Baker). The Mayor suggested that the matter ought not to be discussed at that stage, as there was to be a special meeting in regard to it. It would be as well if they waited until they had the Committee's report, which was not yet before them. Mr. Marriott asked whether, in view of the decision of the General Purposes Committee not to hold the ordinary meeting of the Council and Committees in August, the report would be presented at a special meeting of the Gas Committee, or whether they would have to wait until September to get the report. The Mayor thought that at the present juncture the discussion would be quite out of order. He understood there was to be a special meeting of the Gas Committee regarding the subject; and, in his opinion, there should be also a special meeting of the Council. The matter then dropped.

**Gas Affairs at Heywood.**—The printed minutes of the Heywood Gas Committee stated that at a recent meeting it was resolved that the wages of stokers be advanced to 5s. 9d. per shift without holidays, and the wages of sulphate workers to 5s. 6d. per shift. The minutes also stated the Committee resolved that henceforth the gas supplied to Belgian refugee homes should be charged for. In submitting the minutes for approval at the last meeting of the Town Council, Mr. David Healey, the Chairman of the Gas Committee, said both questions had been fully discussed in committee, as also had the question of coal contracts. They had now let the contracts for the coal required during the next twelve months. The average increase in price was 5s. per ton—equal to 5d. per 1000 cubic feet of gas. So far, they had only increased the price of gas to their consumers by 3d. per 1000 cubic feet, though many undertakings had increased their charges 6d. He hoped it would not be necessary to further increase the price, but three or four months' experience would show whether it was necessary or not.

## Ossett Gas Finances.

At the meeting of the Ossett Town Council on Monday of last week, the Gas Engineer (Mr. A. E. Mottram) presented his fourteenth annual report upon the working of the gas department, which stated that 155,711,000 cubic feet of gas had been made in the year and 145,523,900 cubic feet sold, the respective increases each being a little over 8 million feet. The coal carbonized had been increased from 13,084 to 13,525 tons, and the gas made per ton of coal had improved from 11,290 to 11,512 cubic feet. Through ordinary meters there had been distributed 62,000,000 cubic feet, and through slot meters 35,443,000 feet. In all departments there had been increases, with the exception of gas used for engines. This was accounted for by the extent to which one large firm had been affected by the war. It was also entirely on account of the war that management expenses had gone up ½d. per 1000 feet of gas sold, that taxation was up to a similar extent, and that the receipts from residuals were down 3d. per 1000 cubic feet of gas sold. The mains had been extended to Midgley, and their length was now 56¼ miles. There were 4570 consumers through ordinary meters and 4308 through slot meters. Alderman Harvey Robinson (the Chairman of the Gas Committee) said the financial statement would have been much more satisfactory if there had not been a decrease of £1474 in the revenue from residuals, in spite of the fact that nearly 800 tons more coke were sold than in the previous year. After paying a tribute to the ability and industry of the Gas Engineer (more especially in connection with the successful installation of a new vertical retort plant), he mentioned that one of the bye-products for which there had been scarcely any market was pitch, of which large quantities were exported to Belgium before the war. On this commodity alone the loss of revenue had been £650. Financial relief for the undertaking had been obtained by manipulating the sinking fund in a manner which could only be defended on the ground of the exceptional circumstances created by the war. It was not compulsory for a corporation to set aside any sum towards sinking fund in the first year of borrowing; but the Ossett Council set aside £1134 nine months after purchasing the gas-works in 1901, and credit had now been taken for this amount, after which there was only £63 to carry forward. With regard to the current year, the Committee had to face an outrageous and totally unjustifiable increase in the price of coal; and as there was such uncertainty as to the value of residuals and the extent to which the consumption of gas for manufacturing purposes would be affected by the war, he would not venture upon any prophecy as to the financial results which might be obtained. The report was adopted.

The question of the control of the gas supply in the event of fire in factories and workshops is being considered by the Chorley Town Council. The Gas Manager (Mr. J. W. Allin) has been instructed to approach owners of works where gas-valves have not been provided outside the premises, with a view to this precaution being taken. The Council will carry out the necessary work at cost price.


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**Hipperholme's Rebate to Consumers.**—In these times of increasing prices, it is noticeable that the Hipperholme (Yorkshire) Gas Committee last week decided to grant a rebate of 1d. in 1s. to all prepayment consumers.

**Wolverhampton Water Supply.**—The Water Committee of the Wolverhampton Town Council, in their report on the undertaking for the year ended March 31, record a profit of £1107, which will be transferred to the improvement fund in aid of the rates. The water pumped was 2,795,000,000 gallons; and 14,941 tons of coal were consumed. Of 22,960 houses in the municipal borough, 22,812 are supplied with water from the Corporation works; while of those outside 15,625 are supplied. The daily average consumption last year was 4,006,986 gallons.

**Increase in Price at Carlisle.**—Discussion took place at last Tuesday's meeting of the Carlisle Town Council with reference to a proposed increase from 2s. to 2s. 4d. per 1000 cubic feet in the price of gas. Mr. J. P. Buck (the Chairman of the Gas Committee) said the year had been a record one as to the quantity of gas sold; and the cheap price had been highly appreciated. The Committee were, however, faced with the fact that coal would cost £9000 more; and if they did not raise the price of gas there would be a big deficit. Several members opposed the increase; but eventually it was carried.

**Feltham Public Lighting.**—A letter from the Brentford Gas Company, with reference to the proposed non-lighting of the street-lamps from June to August, was read at a meeting of the Feltham District Council last week. The Company stated that the actual value of the gas saved by adopting the Council's suggestion would amount to only £3 14s., and that taking all the circumstances into consideration they did not consider they ought to be called upon to make any allowance, as they were at present actually carrying on the lighting of Feltham at a loss. It was decided not to make any alteration in the existing public lighting arrangements.

**Morley Gas-Works Results.**—For the first time for many years, there has to be recorded a loss on the year's working of the gas undertaking of the Morley Town Council; the deficit being £1254, as compared with a net profit of £851 for the previous year. The results were, it is stated, seriously affected by delay in the completion of new carbonizing plant. Sales of gas, at 118,456,600 cubic feet, showed an increase of 7,187,700 feet over those of the preceding year. While it is seen to be inevitable that the price of gas should be advanced sooner or later, on the other hand substantial savings are expected to result from the use of the new plant. A Sub-Committee has been appointed to make re-arrangements of the staff for the management of the works in the absence through illness of the Manager, Mr. R. B. Botterill.

**Lighting Matters at Elstree.**—Speaking in respect of the lighting of the parish at the meeting of the Elstree Parish Council last week, the Chairman (Mr. F. De'Ath) said that, as they were now aware, the Gas Company, without the authority of the Council, did not light the parish lamps for a considerable period last year. He was not quite sure that the failure to fulfil their obligations on the part of the Company did not break the contract. He was quite aware they acted on the instructions of the police under the Defence of the Realm Act. The Company had made the Council an allowance which he thought was inadequate. The lights were obscured, so it was questionable whether it would not be as well if they did not light the lamps at all next winter. It would be a saving of £110 to the parish. The Council agreed to obtain legal advice on the subject.

**Bravery Rewarded.**—At Buckingham Palace, on Monday of last week, among other decorations conferred by His Majesty the King, the Edward Medal of the Second Class was bestowed upon Mr. John G. Hinge, for bravery under the following circumstances: On Oct. 1, 1914, Mr. Hinge was engaged, with another man, at the Borstal Institution, Feltham, in removing an obstruction which had occurred in a gas-main, when an explosion occurred, hurling Mr. Hinge out of the door of the building where they were working. The other man was thrown against the opposite wall, and his escape jeopardized by the flaming gas between him and the door. Mr. Hinge pluckily went to his rescue, and succeeded in helping him out. He then, although badly burned and nearly collapsing, took steps to cut off the pressure of the gas, thereby preventing the possibility of further explosions, which might have caused very serious loss of life.

**Mists on Tarred Roads.**—Not a few motorists in the Thames Valley, says the "Motor," will be aware of the recurrence of patches of mist above the surfaces of tarred roads during or after rain. This is very noticeable, to quote a single instance, on the road between Windsor and Egham. The same condensation of vapour does not occur contemporaneously above stretches of road which are surfaced with gravel, or with non-tarred material. The vapour tension—*i.e.*, the tendency of water vapour to behave as a gas—is presumably less on a tarred road than on a gravel or other non-tarred one; and this point is of some importance. Motorists do not enjoy either fleeting or continuous visits to zones of mist. Driving is at times rendered difficult in them; and the dangers of locomotion are undoubtedly increased. The hope is expressed that the experts of the Road Board and of the National Physical Laboratory will include in their series of tests of road-surfacing materials such investigations as will have a due bearing on this factor.

**Hull Water-Works Extensions.**—When making their annual inspection of the Hull water-works last week, the Water Committee had a particularly interesting visit, in view of the extensions which are approaching completion at Holderness, and the early linking-up of Withernsea with the water-main direct from Hull. The party included the Lord Mayor (Alderman Hargreaves), Mr. P. Gaskell (the Chairman of the Water Committee), Mr. W. L. Harrison (the Deputy-Chairman), Mr. C. B. Newton (the Water Engineer), and many members and officials of the Corporation. The trunk main is now laid as far as the parish of Halsham; and it is expected that the 15-mile main to Withernsea will be completed about the end of August. Two service reservoirs are under construction at Batty's Corner, in the parish of Rimswell. They are being built of reinforced concrete; the upper reservoir holding 100,000 gallons, and the lower one 300,000 gallons. The latter will contain the Withernsea supply. The reservoirs will be supplied by automatic electrical pumping.


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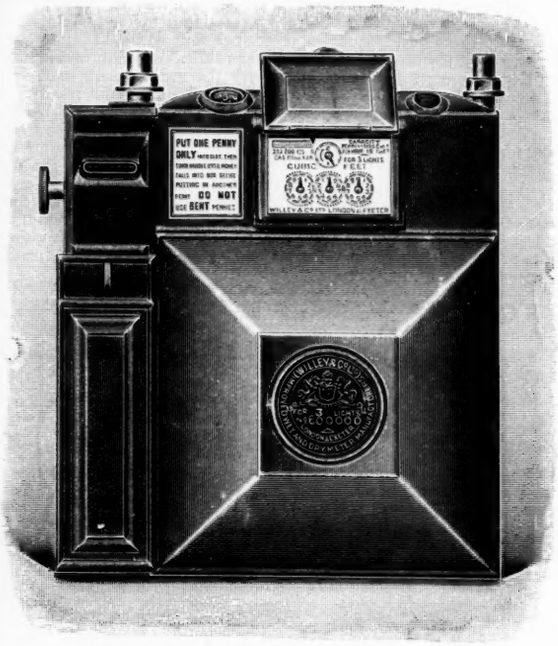


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The Pudsey Gas Company have denied the truth of a rumour that it was their intention to increase the price of gas, in view of the high cost of production under present conditions. The Company do not consider it necessary, this year at any rate, to make an alteration in price.

At a meeting of the Bradford City Council last week, it was reported that the Gas Committee had decided that, as high-pressure gas could not be supplied during the past quarter, no charge should be made for the lamps supplied by the department in connection with such supply for this period.

The Ackworth, Featherstone, Purston, and Sharlston Gas Company, supplying many villages in the South Yorkshire coalfield, have found it necessary to increase the price of gas 3d. per 1000 cubic feet, the change to date from July 1. The Normanton Gas Company, catering for a similar class of supply, have advanced the price 3d.; but the date of the change has been fixed at June 1.

The Hampton Wick Urban District Council, at a meeting last week, had before them a letter from the Gas Company, giving twelve months' notice to determine the existing agreement for public lighting, and stating that they had been compelled to take this step owing to the increase in the price of gas.

The Harrogate Gas Company have increased the price of gas 4d. per 1000 cubic feet. It is stated that this rise will represent only £4500 towards the £10,000 extra the Company will have to pay for coal. The increase is not really a hardship on the consumers, as they have had several decreases in recent times.

As they have not obtained the sanction of the Local Government Board to a loan for capital expenditure upon gas-stoves, fires, and cookers, the Finance Committee of the Leeds Corporation have decided to establish a sinking fund on a ten years' repayment basis, and on the conclusion of the war to make application to the Board for sanction to borrow the necessary money for such appliances.

## GAS COMPANIES IN THE STOCK EXCHANGE.

Last week on the Stock Exchange was to a great extent a second edition of its predecessor—almost a case of War Loan *et præterea nihil*. And thus it seemed bound to be and continue until the issue of the allotments should have opened the way to a free market in the loan, and other like securities should have found their level. Among other speculative contingencies touching the loan which were the subject of some conversation during the week was the question whether the Treasury would fix a minimum price for it; but the weightier balance of opinion seems to be that this is improbable and inadvisable. Business generally all round the markets was very quiet, reaching something like stagnation point on Thursday. But the tone on the whole was very fair, and even cheerful at times, except in quarters exposed to special debilitating factors—*e.g.*, Home Rails in face of the South Wales strike. Colonial issues, and the American, South African, and Foreign markets had their good points; but the old Loan was weak. In the Insurance Market, the event was the issue of the Government anti-aircraft and bombardment scheme. The rates of premium came in for some criticism as being too flat and insufficiently discriminating between the different classes of risk; but the private householder has nothing to complain of. Business in the Gas Market was no more abundant in the aggregate of transactions marked than the week before. As regards recorded prices, those of some issues were rather better than the previous week and some a little lower, but neither was of sufficient magnitude to create a dominating tone. In the Money Market, there was a better demand for short loans, and discount rates were firmer.

Bargains done for cash during the week were as follows: On Monday, Brighton and Hove ordinary 139, Continental Union 39, 39½, Gas Light ordinary 81, 81¼, 81½, 82, 82½, Primitiva preference 3⅜, 3⅝, South Suburban debenture 95. On Tuesday, Gas Light ordinary 81, 81½, 82, ditto debenture 59⅜, 60. On Wednesday, Bournemouth "B" 12 7/16, 12⅝, Cape Town 1 7/16, Commercial 4 per cent. 91¼, 91⅜, Gas Light ordinary 80¾, 81, 81⅛, 81⅛, ditto preference 70, South Metropolitan 83. On Thursday, Gas Light ordinary 80¾, 81, 81¼, ditto debenture 60¼, 60½, Newcastle preference 88, Primitiva 2⅝, South Metropolitan 83⅜, 84, Barnet "B" 134, 135, ditto "D" 105, 105½. On Friday, Gas Light ordinary 81¼, ditto debenture 59½, 59⅝, 60, South Metropolitan 82½, 83, ditto debenture 59½. On Saturday, Gas Light ordinary 81¼, 81⅜, ditto debenture 60¼, 60⅜, South Metropolitan debenture 59½, 60.

Bank rate (fixed Aug. 8), 5 per cent.; last year, 3 per cent.

### LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING JULY 17.

| Issue. | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. July 30. | Yield on Highest Closing Price. | Lowest and Highest Prices of Bargains. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | £ s. d. | |
| 1,551,868 | Stk. | April 8 | 2½ | Alliance & Dublin Ord. | 59—64 | 3 18 2 | .. |
| 374,000 | ,, | July 10 | 4 | Do. 4 p.c. Deb. | 76—79 | 5 1 3 | .. |
| 280,000 | 5 | April 29 | 7½ | Bombay, Ltd. | 5⅞—6⅜ | 5 17 8 | .. |
| 60,000 | 10 | Feb. 26 | 16 | Bournemouth Gas and Water { 10 p.c. | 29—30 | 5 6 8 | .. |
| 873,480 | 10 | ,, | 7 | { B 7 p.c. | 15—15½ | 4 10 4 | 19 7/16—12⅝ |
| 95,000 | 10 | ,, | 6 | { Pref. 6 p.c. | 13½—14 | 4 5 9 | .. |
| — | — | — | — | { Deb. | .. | — | .. |
| 880,000 | Stk. | Feb. 26 | 14 | Brentford Consolidated | 261—266 | 5 5 3 | .. |
| 330,000 | ,, | ,, | 11 | Do. New | 204—209 | 5 5 8 | .. |
| 50,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 109—111 | 4 10 1 | .. |
| 206,250 | ,, | June 11 | 4 | Do. 4 p.c. Deb. | 91—93 | 4 6 0 | .. |
| 217,380 | Stk. | Feb. 26 | 11 | Brighton & Hove Orig. | 208—213 | 5 3 4 | .. |
| 244,200 | ,, | ,, | 8 | Do. A Ord. Stk. | 154—159 | 5 0 8 | 139 |
| 630,000 | 20 | Mar. 26 | 12½ | British | 44—45 | 5 11 1 | .. |
| 120,000 | Stk. | June 26 | 4 | Do. 4 p.c. Deb. Stk. | 88—90 | 4 8 11 | .. |
| 245,771 | Stk. | June 26 | 4 | Buenos Ayres 4 p.c. Deb. | 85—87 | 4 12 0 | .. |
| 100,000 | 10 | — | — | Cape Town & Dis., Ltd. | 1⅛—2⅛ | — | 1 7/16 |
| 100,000 | 10 | — | — | Do. 4½ p.c. Pref. | 4—6 | — | .. |
| 100,000 | Stk. | June 26 | 4½ | Do. 4½ p.c. Deb. Stk. | 70—75 | 6 0 0 | .. |
| 157,150 | Stk. | Feb. 26 | 5 | Chester 5 p.c. Ord. | 108—110 | 4 10 11 | .. |
| 1,513,280 | Stk. | Feb. 12 | 5/9/4 | Commercial 4 p.c. Stk. | 106—108 | 5 1 2 | 91¼—91⅜ |
| 560,000 | ,, | ,, | 5½ | Do. 3½ p.c. do. | 103—105 | 5 1 6 | .. |
| 475,000 | ,, | June 11 | 3 | Do. 3 p.c. Deb. Stk. | 69½—71½ | 4 3 11 | .. |
| 800 000 | Stk. | ,, | 4 | Continental Union, Ltd. | 76—79 | 5 1 3 | .. |
| 200 000 | ,, | ,, | 7 | Do. 7 p.c. Pref. | 115—118 | 5 18 8 | .. |
| — | — | — | — | Croydon B and C 7 p.c. | .. | — | .. |
| 492,270 | Stk. | — | 6 | Derby Con. Stk. | 123—125 | 4 16 0 | .. |
| 55,000 | ,, | — | 4 | Do. Deb. Stk. | 102—104 | 3 16 11 | .. |
| 1,002,180 | 10 | July 29 | 10 | European, Ltd. | 17½—18 | 5 11 1 | .. |
| 16,361,910 | Stk. | Feb. 12 | 4/17/4 | Gas { 4 p.c. Ord. | 98—102 | 4 15 6 | 80½—82½ |
| 2,600,000 | ,, | ,, | 3½ | Light { 3½ p.c. max. | 76—79 | 4 8 7 | .. |
| 4,062,235 | ,, | ,, | 4 | and { 4 p.c. Con. Pref. | 96—99 | 4 0 10 | 70 |
| 4,674,850 | ,, | June 11 | 3 | Coke { 3 p.c. Con. Deb. | 72½—74½ | 4 0 6 | 59½—60½ |
| 120,000 | ,, | ,, | 10 | { 10 p.c. Bonds | .. | — | .. |
| 258,740 | Stk. | Mar. 12 | 5 | Hastings & St. L. 3½ p.c. | 87—89 | 5 12 4 | .. |
| 70,000 | 10 | April 29 | 11 | Hongkong & China, Ltd. | 16½—16⅞ | 6 11 4 | .. |
| — | — | — | — | Hornsey 7 p.c. | .. | — | .. |
| 131,000 | Stk. | Mar. 12 | 7/7/1 | Ilford A and C | 151—154 | 5 2 4 | .. |
| 65,780 | ,, | ,, | 6⅜ | Do. B | 115—118 | 5 8 0 | .. |
| 65,500 | ,, | June 26 | 4 | Do. 4 p.c. Deb. | 92—94 | 4 5 1 | .. |
| 4,940,000 | Stk. | May 14 | 9 | Imperial Continental | 150—160 | 5 12 6 | .. |
| 1,235,000 | Stk. | Feb. 12 | 3½ | Do. 3½ p.c. Deb. Red. | 84—86 | 4 1 5 | .. |
| 200,242 | Stk. | Mar. 12 | 6½ | Lea Bridge Ord. 5 p.c. | 119—121 | 5 7 0 | .. |
| 561,000 | Stk. | Feb. 26 | 10 | { Liverpool 5 p.c. Ord. { A | 211—213 | 4 13 11 | .. |
| 718,100 | ,, | ,, | 7 | { { B | 146—14 | 4 14 7 | .. |
| 306,083 | ,, | June 26 | 4 | Do. 4 p.c. Pr. Deb. Stk. | .. | — | — |

| Issue. | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. July 30. | Yield on Highest Closing Price. | Lowest and Highest Prices of Bargains. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | £ s. d. | |
| 75,000 | 5 | June 11 | 0 | Malta & Mediterranean | 4⅛—4⅝ | 6 9 9 | .. |
| 250,000 | 100 | April 1 | 4½ | Met. of Melbourne { 4½ p.c. Deb. | 99—101 | 4 9 1 | .. |
| 541,920 | 20 | May 28 | 4 | Monte Video, Ltd. | 11½—12 | 6 13 4 | .. |
| 1,775,892 | Stk. | July 29 | 4½ | Newc'tle&G'tesh'd Con. | 98½—99½ | 4 10 6 | .. |
| 529,705 | Stk. | June 26 | 3½ | Do. 3½ p.c. Deb | 82—83 | 4 4 10 | .. |
| 55,940 | 10 | Feb. 26 | 7/14/0 | North Middlesex 7 p.c. | 14—15 | 5 2 5 | .. |
| 300,000 | Stk. | May 14 | 8 | Oriental, Ltd. | 117—122 | 6 11 2 | .. |
| 60,000 | 5 | Mar. 26 | 10 | Ottoman, Ltd. | 7⅛—7⅜ | 6 9 0 | .. |
| 60,000 | 50 | Feb. 26 | 13 | Portsea, Island B | 128—131 | 4 19 8 | .. |
| 100,000 | 50 | ,, | 19 | Do. C | 118—121 | 4 19 2 | .. |
| 52,000 | 50 | ,, | 10 | Do. D | .. | — | .. |
| 249,980 | 5 | April 29 | e | Primitiva Ord. | 5⅛—6 | 6 18 4 | 2⅝ |
| 499,960 | 5 | June 26 | 5 | ,, 5 p.c. Pref. | 4⅝—5 | 5 0 0 | 3⅜—3⅞ |
| 521,600 | 100 | June 2 | 4 | ,, 4 p.c. Deb. | 91—98 | 4 6 0 | .. |
| — | — | — | — | ,, ,, ,, 1911 | .. | — | .. |
| 346,198 | Stk. | June 26 | 4 | River Plate 4 p.c. Deb. | 85—87 | 4 12 0 | .. |
| 150,000 | 10 | May 14 | 6 | San Paulo { 6 p.c. Pref | 10½—11 | 5 9 1 | .. |
| 125,000 | 50 | July 1 | 5 | { 5 p.c. Deb. | 47—49 | 5 2 0 | .. |
| 135,000 | Stk. | Mar. 12 | 10 | Sheffield A | 233—234 | 4 9 9 | .. |
| 209,984 | ,, | ,, | 10 | Do. B | 232—234 | 4 9 8 | .. |
| 523,500 | ,, | ,, | 10 | Do. C | 230—232 | 4 10 1 | .. |
| 90,000 | 10 | May 28 | 9 | South African | 10⅞—11⅛ | 7 16 6 | .. |
| 6,429,895 | Stk. | Feb. 12 | 5/4/0 | South Met., 4 p.c. Ord. | 111—113 | 4 16 8 | 82—84 |
| 1,895,445 | ,, | July 10 | 3 | Do. 3 p.c. Deb. | 72½—74½ | 4 0 6 | 59½—60 |
| 209,820 | Stk. | Feb. 26 | 8½ | South Shields Con. Stk | 157—159 | 5 6 11 | .. |
| 952,795 | Stk. | Feb. 26 | 6 | S'th Suburb'n Ord. 5 p.c. | 114—116 | 5 3 1 | .. |
| 60,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 110—112 | 4 9 3 | .. |
| — | — | — | — | Do. West Kent. | .. | — | .. |
| 137,058 | ,, | June 26 | 5 | Do. 5 p.c. Deb. Stk. | 116—118 | 4 4 9 | 95 |
| 629,740 | Stk. | May 14 | 5 | Southampton Ord. | 99—102 | 4 18 0 | |
| 120,000 | Stk. | Feb. 12 | 7½† | Tottenham { A 5 p.c. | 135—138 | 5 8 8 | .. |
| 742,275 | ,, | ,, | 6† | District { B 3½ p.c. | 116—117 | 5 2 7 | .. |
| 181,255 | ,, | June 26 | 4 | { 4 p.c. Deb. | 87—89 | 4 9 11 | .. |
| 182,380 | 10 | Dec. 30 | 5 | Tuscan, Ltd. | 5—6 | 8 6 8 | .. |
| 149,900 | 10 | July 1 | 5 | Do. 5 p.c. Deb. Red. | 93—95 | 5 5 3 | .. |
| 236,476 | Stk. | Mar. 12 | 5 | Tynemouth, 5 p.c. max. | 108½—109½ | 4 11 4 | .. |
| 30,000 | Stk. | Feb. 26 | 8⅜ | Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c. | 151—156 | 5 7 4 | .. |
| 255,636 | ,, | ,, | 6⅞ | ,, B 3½ p.c. | 129—134 | 5 2 7 | .. |
| 108,075 | ,, | ,, | 5/17/8 | ,, C 3½ p.c. | 110—115 | 5 2 0 | .. |
| 352,000 | ,, | ,, | 6½ | Wimbledon 5 p.c. | 117—122 | 5 0 6 | .. |
| 98,000 | ,, | ,, | 6½ | Epsom 5 p.c. | 121—126 | 5 5 2 | .. |
| 88,416 | ,, | June 26 | 3 | 3 p.c. Deb. Stk. | 66—69 | 4 6 11 | .. |

## WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

### Appointments, &c., Vacant.

MAIN AND SERVICE LAYER, &c. No. 6069.
GAS-WORKS FITTER. No. 6066.
METER REPAIRERS. No. 6067.
WORKS FITTER. Sevenoaks Gas Company.
CLERK AND CASHIER. Malton Gas Company.

### Appointments Wanted.

TRAVELLER. No. 6068.

### Plant (Second-Hand) for Sale.

SULPHATE PLANT, WASHER, &c. Rothesay Gas-Works. Tenders by Aug. 2.

### Meetings.

SOUTH METROPOLITAN GAS COMPANY. De Keyser's Hotel. Aug. 11. Two o'clock.
SOUTH SUBURBAN GAS COMPANY. De Keyser's Hotel. Aug. 13. Three o'clock.
TOTTENHAM GAS COMPANY. Works. Aug. 7. Three o'clock.

### TENDERS FOR

**Coal.**
SHEFFIELD GAS COMPANY. Tenders by July 22.

**Oxide (Spent).**
BARNSLEY GAS COMPANY. Tenders by July 28.

**Sulphate of Ammonia Saturator.**
BRIDGWATER GASLIGHT COMPANY.

**Tar.**
NORTHWICH GAS COMPANY. Tenders by July 24.

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